Permit Number: AR0001392
AFIN: 58-00002

AUTHORIZATION TO DISCHARGE WASTEWATER UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND THE ARKANSAS WATER AND AIR POLLUTION CONTROL ACT

In accordance with the provisions of the Arkansas Water and Air Pollution Control Act (Ark. Code Ann. 8-4-101 et seq.), and the Clean Water Act (33 U.S.C. § 1251 et seq.),

Entergy Arkansas, LLC
Arkansas Nuclear One

is authorized to discharge once through cooling water, cooling tower blowdown, treated sanitary wastewater, low volume wastewater, and stormwater from a facility located as follows: 1448 S.R. 333, Russellville, AR 72802, in Pope County.

Facility Coordinates: Latitude: 35° 18' 30.9" N; Longitude: 93° 13' 25.4" W

Discharge is to receiving waters named:

Outfall 001 and 006: Lake Dardanelle (an impoundment of the Arkansas River), thence to the Arkansas River in Segment 3H of the Arkansas River Basin.
Outfalls 009 through 013: unnamed tributaries, thence to Lake Dardanelle (an impoundment of the Arkansas River), thence to the Arkansas River in Segment 3H of the Arkansas River Basin.

The outfalls are located at the following coordinates:

Outfall 001:	Latitude: 35° 18' 32.5" N;	Longitude: 93° 13' 52.2" W
Internal Outfall 002:	Latitude: 35° 18' 38.4" N;	Longitude: 93° 14' 02.9" W
Internal Outfall 003:	Latitude: 35° 18' 35.3" N;	Longitude: 93° 13' 48.6" W
Internal Outfall 004:	Latitude: 35° 18' 37.0" N;	Longitude: 93° 13' 52.0" W
Internal Outfall 005:	Latitude: 35° 18' 33.3" N;	Longitude: 93° 14' 13.0" W
Outfall 006:	Latitude: 35° 18' 27.3" N;	Longitude: 93° 13' 51.2" W
Internal Outfall 008:	Latitude: 35° 18' 39.4" N;	Longitude: 93° 13' 56.6" W
Outfall 009:	Latitude: 35° 18' 51.0" N;	Longitude: 93° 14' 12.3" W
Outfall 010:	Latitude: 35° 18' 40.0" N;	Longitude: 93° 13' 54.7" W
Outfall 011:	Latitude: 35° 18' 33.9" N;	Longitude: 93° 13' 55.7" W
Outfall 012:	Latitude: 35° 18' 39.9" N;	Longitude: 93° 13' 49.7" W
Outfall 013:	Latitude: 35° 18' 42.4" N;	Longitude: 93° 14' 06.9" W

Discharge shall be in accordance with effluent limitations, monitoring requirements, and other conditions set forth in this permit. Per Part III.D.10, the permittee must re-apply 180 days prior to the expiration date below for permit coverage to continue beyond the expiration date.

Effective Date: December 1, 2023
Expiration Date: November 30, 2028



Stacie R. Wassell
Associate Director, Office of Water Quality
Arkansas Department of Energy and Environment
Division of Environmental Quality

November 20, 2023
Issue Date

PART I
PERMIT REQUIREMENTS

SECTION A1. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: OUTFALL 001 - once through cooling water that flows through Unit 1 condenser and Units 1 and 2 service water systems, and effluent from Internal Outfalls 002, 003, 004, 005 and 008.

During the period beginning on the effective date and lasting until the date of expiration, the permittee is authorized to discharge from Outfall 001. Such discharges shall be limited and monitored by the permittee as specified below as well as Parts II and III. See Part IV for all definitions.

Effluent Characteristics	Discharge Limitations				Monitoring Requirements	
	Mass (lbs/day, unless otherwise specified)		Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.		
Flow	N/A	N/A	Report, MGD	Report, MGD	once/day[6]	calculate[5]
Total Residual Oxidants (TRO)[1]	N/A	158.8	N/A	0.2	once/week[6]	grab
Oil and Grease (O&G)	N/A	N/A	10	15	once/month[6]	grab
Temperature[2]	N/A	N/A	105 ºF	110 ºF	continuous[6]	record
Fecal Coliform Bacteria (FCB)			(colonies/100ml)			
(May – September)	N/A	N/A	200	400	once/5-months[6]	grab
(October – April)	N/A	N/A	1000	2000	once/7-months[6]	grab
pH	N/A	N/A	Minimum 6.0 s.u.	Maximum 9.0 s.u.	twice/month[6]	grab
Whole Effluent Toxicity						
***Pimephales promelas* (Chronic)[3]**	N/A		Value Report			
Pass/Fail Lethality (7-day NOEC) TLP6C			(Pass=0/Fail=1)		once/quarter[6]	composite
Pass/Fail Growth (7-day NOEC) TGP6C			Report (Pass=0/Fail=1)		once/quarter[6]	composite
Survival (7-day NOEC) TOP6C			Report %		once/quarter[6]	composite
Coefficient of Variation (Growth) TQP6C			Report %		once/quarter[6]	composite
Growth (7-day NOEC) TPP6C			Report %		once/quarter[6]	composite
Pass/Fail Retest 1 (7-day NOEC) 22418			Report (Pass=0/Fail=1)		once/month[4,6]	composite
Pass/Fail Retest 2 (7-day NOEC) 22419			Report (Pass=0/Fail=1)		once/month[4,6]	composite
Pass/Fail Retest 3 (7-day NOEC) 51444			Report (Pass=0/Fail=1)		once/month[4,6]	composite
***Ceriodaphnia dubia* (Chronic)[3]**			Value Report			
Pass/Fail Lethality (7-day NOEC) TLP3B			(Pass=0/Fail=1)		once/quarter[6]	composite
Pass/Fail Reproduction (7-day NOEC) TGP3B			Report (Pass=0/Fail=1)		once/quarter[6]	composite
Survival (7-day NOEC) TOP3B			Report %		once/quarter[6]	composite
Coefficient of Variation (Reproduction) TQP3B			Report %		once/quarter[6]	composite
Reproduction (7-day NOEC) TPP3B			Report %		once/quarter[6]	composite
Pass/Fail Retest 1 (7-day NOEC) 22415			Report (Pass=0/Fail=1)		once/month[4,6]	composite
Pass/Fail Retest 2 (7-day NOEC) 22416			Report (Pass=0/Fail=1)		once/month[4,6]	composite
Pass/Fail Retest 3 (7-day NOEC) 51443			Report (Pass=0/Fail=1)		once/month[4,6]	composite

1 See Part II.9. (Total Residual Oxidants requirements).
2 See Part II.7. (Temperature reporting requirements).
3 See Part II.14 (WET Testing Requirements).
4 CONDITIONAL REPORTING: Use only if conducting retests due to a test failure (demonstration of significant toxic effects at or below the critical dilution). If testing on a quarterly basis, the permittee may substitute one of the retests in lieu of one routine toxicity test. If

retests are not required, Report NODI=9 (Conditional Monitoring - Not Required This Period) under retest parameters (reported on a quarterly DMR). This condition applies to *P. promelas* and *C. dubia*.

[5] See Part II.5 (Flow reporting requirement).

[6] When discharging.

Oil, grease, or petrochemical substances shall not be present in receiving waters to the extent that they produce globules or other residue or any visible, colored film on the surface or coat the banks and/or bottoms of the waterbody or adversely affect any of the associated biota. There shall be no visible sheen as defined in Part IV of this permit.

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge during the entire monitoring period. Samples shall be taken south of security controlled area from the discharge canal.

PART I
PERMIT REQUIREMENTS

SECTION A2. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: INTERNAL OUTFALL 002 – Cooling Tower Blowdown from Unit 2 and effluent from Internal Outfalls 005 and 008.

During the period beginning on the effective date and lasting until the date of expiration, the permittee is authorized to discharge from Internal Outfall 002. Such discharges shall be limited and monitored by the permittee as specified below as well as Parts II and III. See Part IV for all definitions.

Effluent Characteristics	Discharge Limitations				Monitoring Requirements	
	Mass (lbs/day, unless otherwise specified)		Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.		
Flow	N/A	N/A	Report, MGD	Report, MGD	once/day[1]	totalizing meter[5]
Free Available Oxidants (FAO)[2]	0.8	1.9	0.2	0.5	once/week[1]	grab
Chromium, Total Recoverable (Cr)[3]	N/A	N/A	0.2	0.2	N/A[3]	N/A[3]
Zinc, Total Recoverable (Zn)[3]	N/A	N/A	1.0	1.0	N/A[3]	N/A[3]
126 Priority Pollutants (Appendix A to Part 423) contained in chemicals added for cooling tower maintenance, except Chromium and Zinc. [3]	N/A	N/A	ND[4]	ND[4]	N/A[3]	N/A[3]
pH	N/A	N/A	Minimum 6.0 s.u.	Maximum 9.0 s.u.	once/month[1]	grab

[1] When discharging.
[2] See Part II.8 (Free Available Oxidants requirements).
[3] Monitoring for Chromium and Zinc, and the 126 Priority Pollutants is waived at Internal Outfall 002 during this permit term based on 40 C.F.R. § 122.44(a)(2) and a certification dated August 15, 2018 from the facility that no cooling tower maintenance chemicals containing any priority pollutant is used at the facility. See Part II.11.
[4] ND = Non-detectable amount by analytical methods in 40 C.F.R. Part 136.
[5] In the event the cooling tower blowdown totalizer fails, the cooling tower basin must be drained to access the totalizer for repair. During this period, the permittee is allowed to estimate flow based on maximum discharge flow capability until the totalizer is back online.

Oil, grease, or petrochemical substances shall not be present in receiving waters to the extent that they produce globules or other residue or any visible, colored film on the surface or coat the banks and/or bottoms of the waterbody or adversely affect any of the associated biota. There shall be no visible sheen as defined in Part IV of this permit.

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge during the entire monitoring period. Samples shall be taken at the southeast side of the base of the cooling tower.

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PERMIT REQUIREMENTS

SECTION A3. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: INTERNAL OUTFALL 003 – low volume wastewaters as defined in 40 C.F.R. Part 423 consisting of discharge from Unit 1 and 2 turbine building sumps (primary and secondary water systems consisting of, but not limited to, system drains, system leakage, steam generator blowdown, turbine building equipment and floor washdown drains), diesel tank sumps, groundwater, and maintenance wastewaters.

During the period beginning on the effective date and lasting until the date of expiration, the permittee is authorized to discharge from Internal Outfall 003. Such discharges shall be limited and monitored by the permittee as specified below as well as Parts II and III. See Part IV for all definitions.

Effluent Characteristics	**Discharge Limitations**				**Monitoring Requirements**	
	Mass (lbs/day, unless otherwise specified)		Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.		
Flow	N/A	N/A	Report, MGD	Report, MGD	once/week[1]	totalizing meter[2]
Total Suspended Solids (TSS)	N/A	N/A	30.0	100.0	once/month[1]	grab
Oil and Grease (O&G)	N/A	N/A	15.0	20.0	once/month[1]	grab
pH	N/A	N/A	Minimum 6.0 s.u.	Maximum 9.0 s.u.	once/month[1]	grab

[1] When discharging.
[2] In the event of totalizing meter failure, the permittee is allowed to estimate flow based on pump capacity and pump run time.

Oil, grease, or petrochemical substances shall not be present in receiving waters to the extent that they produce globules or other residue or any visible, colored film on the surface or coat the banks and/or bottoms of the waterbody or adversely affect any of the associated biota. There shall be no visible sheen as defined in Part IV of this permit.

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge during the entire monitoring period. Samples shall be taken at discharge from skimmer tank before mixing with any other wastestreams approximately 100 yards north of the cooling water intake screens.

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PERMIT REQUIREMENTS

SECTION A4. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: INTERNAL OUTFALL 004 – low volume wastewaters as defined in 40 C.F.R. Part 423 consisting of discharge from holding tanks associated with low level wastewater treatment system for Units 1 and 2 primary and secondary water systems, backwash from demineralizer and regeneration water system, and maintenance wastewaters.

During the period beginning on the effective date and lasting until the date of expiration, the permittee is authorized to discharge from Internal Outfall 004. Such discharges shall be limited and monitored by the permittee as specified below as well as Parts II and III. See Part IV for all definitions.

Effluent Characteristics	Discharge Limitations				Monitoring Requirements	
	Mass (lbs/day, unless otherwise specified)		Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.		
Flow	N/A	N/A	Report, MGD	Report, MGD	once/discharge	calculate
Total Suspended Solids (TSS)	N/A	N/A	30.0	100.0	once/month[1,2]	grab
Oil and Grease (O&G)	N/A	N/A	15.0	20.0	once/month[1,2]	grab
pH	N/A	N/A	Minimum 6.0 s.u.	Maximum 9.0 s.u.	once/month[1,2]	grab

[1] When discharging.
[2] Sampling of only one of the eight tanks that make up Internal Outfall 004 is necessary to meet monitoring requirements.

Oil, grease, or petrochemical substances shall not be present in receiving waters to the extent that they produce globules or other residue or any visible, colored film on the surface or coat the banks and/or bottoms of the waterbody or adversely affect any of the associated biota. There shall be no visible sheen as defined in Part IV of this permit.

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge during the entire monitoring period. Samples shall be taken at Internal Outfall 004 before mixing with any other wastestreams.

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SECTION A5. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: INTERNAL OUTFALL 005 – treated sanitary wastewater from wastewater treatment plant, and low volume wastewaters as defined in 40 C.F.R. Part 423 consisting of potable water, blowdown from GSB cooling tower, and effluent from Internal Outfall 008 consisting of maintenance wastewaters, reverse osmosis reject water, and periodic discharge of chemicals from backwash/cleaning the ultra-pure water system[2].

During the period beginning on the effective date and lasting until the date of expiration, the permittee is authorized to discharge from Internal Outfall 005. Such discharges shall be limited and monitored by the permittee as specified below as well as Parts II and III. See Part IV for all definitions.

Effluent Characteristics	Discharge Limitations				Monitoring Requirements	
	Mass (lbs/day, unless otherwise specified)		Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.		
Flow	N/A	N/A	Report, MGD	Report, MGD	once/week[1]	totalizing meter
Biochemical Oxygen Demand (BOD_5)	N/A	N/A	30	45	once/month[1]	grab
Total Suspended Solids (TSS)	N/A	N/A	30.0	45.0	once/month[1]	grab
Oil and Grease (O&G)	N/A	N/A	15.0	20.0	once/month[1]	grab
pH	N/A	N/A	Minimum 6.0 s.u.	Maximum 9.0 s.u.	once/month[1]	grab

[1] When discharging.
[2] Periodic discharge of maintenance chemicals (HCl, H2O2, C6H8O7, NaCl, and NaOH) from cleaning the ultra pure water processing system is authorized through Internal Outfall 005, provided the maintenance chemicals are first neutralized (pH 6.0-9.0) and then discharged at a rate that will not overload the hydraulic capacity of the sewage treatment plant or create a shock load on the sewage treatment plant.

Oil, grease, or petrochemical substances shall not be present in receiving waters to the extent that they produce globules or other residue or any visible, colored film on the surface or coat the banks and/or bottoms of the waterbody or adversely affect any of the associated biota. There shall be no visible sheen as defined in Part IV of this permit.

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge during the entire monitoring period. Samples shall be taken after the chlorine contact chamber, before mixing with any other wastestreams approximately 245 yards southwest of the base of the cooling tower.

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PERMIT REQUIREMENTS

SECTION A6. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: OUTFALL 006 – low volume wastewater as defined in 40 C.F.R. Part 423 consisting of discharge from wastewater holding pond used for collection of wastewater from Unit 1 and 2 turbine building sumps (primary and secondary water systems consisting of, but not limited to, system drains, system leakage, steam generator blowdown, turbine building equipment and floor washdown drains), diesel tank sumps, groundwater, and maintenance wastewaters
During the period beginning on the effective date and lasting until the date of expiration, the permittee is authorized to discharge from Outfall 006. Such discharges shall be limited and monitored by the permittee as specified below as well as Parts II and III. See Part IV for all definitions.

Effluent Characteristics	Discharge Limitations				Monitoring Requirements	
	Mass (lbs/day, unless otherwise specified)		Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.		
Flow	N/A	N/A	Report, MGD	Report, MGD	once/day[1]	totalizing meter
Total Suspended Solids (TSS)	N/A	N/A	30.0	100.0	once/week[1]	grab
Oil and Grease (O&G)	N/A	N/A	10	15	once/week[1]	grab
pH	N/A	N/A	Minimum 6.0 s.u.	Maximum 9.0 s.u.	once/week[1]	grab

[1] When discharging.

Oil, grease, or petrochemical substances shall not be present in receiving waters to the extent that they produce globules or other residue or any visible, colored film on the surface or coat the banks and/or bottoms of the waterbody or adversely affect any of the associated biota. There shall be no visible sheen as defined in Part IV of this permit.

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge during the entire monitoring period. Samples shall be taken from the holding pond discharge pipe, prior to entering effluent canal.

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SECTION A7. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: INTERNAL OUTFALL 008 – low volume wastewater as defined in 40 C.F.R. Part 423 consisting of backwash, reject, and maintenance wastewaters from reverse osmosis units associated with the ultra-pure water system.

During the period beginning on the effective date and lasting until the date of expiration, the permittee is authorized to discharge from Outfall 008. Such discharges shall be limited and monitored by the permittee as specified below as well as Parts II and III. See Part IV for all definitions.

Effluent Characteristics	Discharge Limitations				Monitoring Requirements	
	Mass (lbs/day, unless otherwise specified)		Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.		
Flow	N/A	N/A	Report, MGD	Report, MGD	once/week[1]	calculate[2]
Total Suspended Solids (TSS)	N/A	N/A	30.0	100.0	once/month[1]	grab
Oil and Grease (O&G)	N/A	N/A	15.0	20.0	once/month[1]	grab
pH	N/A	N/A	Minimum 6.0 s.u.	Maximum 9.0 s.u.	once/month[1]	grab

[1] When discharging.
[2] "Calculate" means the difference between intake water and process effluent.

Oil, grease, or petrochemical substances shall not be present in receiving waters to the extent that they produce globules or other residue or any visible, colored film on the surface or coat the banks and/or bottoms of the waterbody or adversely affect any of the associated biota. There shall be no visible sheen as defined in Part IV of this permit.

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge during the entire monitoring period. Samples shall be taken at the Outfall 008 sample port inside small building approximately 165 yards east of the base of the cooling tower.

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SECTION A8. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: OUTFALL 009 – discharge from emergency cooling pond consisting of lake water, city water, stormwater, and Unit 1 and 2 service water.

During the period beginning on the effective date and lasting until the date of expiration, the permittee is authorized to discharge from Outfall 009. Such discharges shall be limited and monitored by the permittee as specified below as well as Parts II and III. See Part IV for all definitions.

Effluent Characteristics	Discharge Limitations				Monitoring Requirements	
	Mass (lbs/day, unless otherwise specified)		Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.		
Flow	N/A	N/A	Report, MGD	Report, MGD	once/day[1]	estimate
Total Residual Oxidants (TRO)	N/A	0.5	N/A	0.2	twice/month[1]	grab
Oil and Grease (O&G)	N/A	N/A	10	15	twice/month[1]	grab
Total Recoverable Arsenic	N/A	N/A	Report	Report	once/quarter[1,2]	grab
pH	N/A	N/A	Minimum 6.0 s.u.	Maximum 9.0 s.u.	twice/month[1]	grab

[1] When discharging.
[2] Monitoring and reporting for Arsenic is required for first year of the permit only.

Oil, grease, or petrochemical substances shall not be present in receiving waters to the extent that they produce globules or other residue or any visible, colored film on the surface or coat the banks and/or bottoms of the waterbody or adversely affect any of the associated biota. There shall be no visible sheen as defined in Part IV of this permit.

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge during the entire monitoring period. Samples shall be taken at the end of concrete pad below the emergency cooling pond spillway.

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SECTION A9. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: OUTFALL 010 – low volume wastewater as defined in 40 C.F.R. Part 423 consisting of discharge from temporary maintenance activities associated with draining cooling water systems, operation of temporary cooling water systems, and stormwater.

During the period beginning on the effective date and lasting until the date of expiration, the permittee is authorized to discharge from Outfall 010. Such discharges shall be limited and monitored by the permittee as specified below as well as Parts II and III. See Part IV for all definitions.

Effluent Characteristics	**Discharge Limitations**				**Monitoring Requirements**	
	Mass (lbs/day, unless otherwise specified)		Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.		
Flow	N/A	N/A	Report, MGD	Report, MGD	once/month[1]	estimate
Total Suspended Solids (TSS)	N/A	N/A	30.0	100.0	once/month[1]	grab
Oil and Grease (O&G)	N/A	N/A	10	15	once/month[1]	grab
pH	N/A	N/A	Minimum 6.0 s.u.	Maximum 9.0 s.u.	once/month[1]	grab

[1] When discharging.

Oil, grease, or petrochemical substances shall not be present in receiving waters to the extent that they produce globules or other residue or any visible, colored film on the surface or coat the banks and/or bottoms of the waterbody or adversely affect any of the associated biota. There shall be no visible sheen as defined in Part IV of this permit.

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge during the entire monitoring period. Samples shall be taken on the north end of the Unit 2 turbine building at storm drain located north of the Unit 2 Acid/Caustic Tank Building approximately 220 yards east of the base of the cooling tower.

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PERMIT REQUIREMENTS

SECTION A10. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: OUTFALL 011 - low volume wastewater as defined in 40 C.F.R. Part 423 consisting of discharge from temporary maintenance activities associated with draining cooling water systems, operation of temporary cooling water systems, and stormwater.

During the period beginning on the effective date and lasting until the date of expiration, the permittee is authorized to discharge from Outfall 011. Such discharges shall be limited and monitored by the permittee as specified below as well as Parts II and III. See Part IV for all definitions.

Effluent Characteristics	Discharge Limitations				Monitoring Requirements	
	Mass (lbs/day, unless otherwise specified)		Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.		
Flow	N/A	N/A	Report, MGD	Report, MGD	once/month[1]	estimate
Total Suspended Solids (TSS)	N/A	N/A	30.0	100.0	once/month[1]	grab
Oil and Grease (O&G)	N/A	N/A	10	15	once/month[1]	grab
pH	N/A	N/A	Minimum 6.0 s.u.	Maximum 9.0 s.u.	once/month[1]	grab

[1] When discharging.

Oil, grease, or petrochemical substances shall not be present in receiving waters to the extent that they produce globules or other residue or any visible, colored film on the surface or coat the banks and/or bottoms of the waterbody or adversely affect any of the associated biota. There shall be no visible sheen as defined in Part IV of this permit.

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge during the entire monitoring period. Samples shall be taken on the west side of the Administration Building at the storm drain located approximately 110 yards northwest of Outfall 001.

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PERMIT REQUIREMENTS

SECTION A11. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: OUTFALL 012 - low volume wastewater as defined in 40 C.F.R. Part 423 consisting of discharge from temporary maintenance activities associated with draining cooling water systems, operation of temporary cooling water systems, and stormwater.

During the period beginning on the effective date and lasting until the date of expiration, the permittee is authorized to discharge from Outfall 012. Such discharges shall be limited and monitored by the permittee as specified below as well as Parts II and III. See Part IV for all definitions.

Effluent Characteristics	Discharge Limitations				Monitoring Requirements	
	Mass (lbs/day, unless otherwise specified)		Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.		
Flow	N/A	N/A	Report, MGD	Report, MGD	once/month[1]	estimate
Total Suspended Solids (TSS)	N/A	N/A	30.0	100.0	once/month[1]	grab
Oil and Grease (O&G)	N/A	N/A	10	15	once/month[1]	grab
pH	N/A	N/A	Minimum 6.0 s.u.	Maximum 9.0 s.u.	once/month[1]	grab

[1] When discharging.

Oil, grease, or petrochemical substances shall not be present in receiving waters to the extent that they produce globules or other residue or any visible, colored film on the surface or coat the banks and/or bottoms of the waterbody or adversely affect any of the associated biota. There shall be no visible sheen as defined in Part IV of this permit.

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge during the entire monitoring period. Samples shall be taken on the east side of the breezeway between the Unit 2 Turbine Building and maintenance facility at the storm drain located approximately 350 yards east of the base of the cooling tower.

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PERMIT REQUIREMENTS

SECTION A12. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: OUTFALL 013 - low volume wastewater as defined in 40 C.F.R. Part 423 consisting of discharge from temporary maintenance activities associated with cooling tower screen washing.

During the period beginning on the effective date and lasting until the date of expiration, the permittee is authorized to discharge from Outfall 013. Such discharges shall be limited and monitored by the permittee as specified below as well as Parts II and III. See Part IV for all definitions.

Effluent Characteristics	Discharge Limitations				Monitoring Requirements	
	Mass (lbs/day, unless otherwise specified)		Concentration (mg/l, unless otherwise specified)		Frequency	Sample Type
	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.		
Flow	N/A	N/A	Report, MGD	Report, MGD	once/month[1]	estimate
Total Suspended Solids (TSS)	N/A	N/A	30.0	100.0	once/month[1]	grab
Oil and Grease (O&G)	N/A	N/A	10	15	once/month[1]	grab
Total Recoverable Arsenic	N/A	N/A	Report	Report	once/quarter[1,2]	grab
pH	N/A	N/A	Minimum 6.0 s.u.	Maximum 9.0 s.u.	once/month[1]	grab

[1] Monitoring shall be performed when discharging during cooling tower screen washing activity.
[2] Monitoring and reporting for Arsenic is required for first year of the permit only.

Oil, grease, or petrochemical substances shall not be present in receiving waters to the extent that they produce globules or other residue or any visible, colored film on the surface or coat the banks and/or bottoms of the waterbody or adversely affect any of the associated biota. There shall be no visible sheen as defined in Part IV of this permit.

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge during the entire monitoring period. Samples shall be taken at the concrete box culvert under North Access Road approximately 60 yards northwest of the base of the cooling tower.

SECTION B. PERMIT COMPLIANCE SCHEDULE

None.

PART II
OTHER CONDITIONS

1. The operator of this wastewater treatment facility shall hold an Advanced Industrial license from the State of Arkansas in accordance with APC&EC Rule 3.

2. In accordance with 40 C.F.R. §§ 122.62(a)(2) and 124.5, this permit may be reopened for modification or revocation and/or reissuance to require additional monitoring and/or effluent limitations when new information is received that actual or potential exceedance of State water quality criteria and/or narrative criteria are determined to be the result of the permittee's discharge(s) to a relevant water body or a Total Maximum Daily Load (TMDL) is established or revised for the water body that was not available at the time of the permit issuance that would have justified the application of different permit conditions at the time of permit issuance.

3. Other Specified Monitoring Requirements

   The permittee may use alternative appropriate monitoring methods and analytical instruments other than as specified in Part I Section A of the permit without a major permit modification under the following conditions:

   - The monitoring and analytical instruments are consistent with accepted scientific practices.
   - The requests shall be submitted in writing to the Permits Branch of the Office of Water Quality of the DEQ for use of the alternate method or instrument.
   - The method and/or instrument is in compliance with 40 C.F.R. Part 136 or approved in accordance with 40 C.F.R. § 136.5.
   - All associated devices are installed, calibrated, and maintained to ensure the accuracy of the measurements and are consistent with the accepted capability of that type of device. The calibration and maintenance shall be performed as part of the permittee's laboratory Quality Assurance/Quality Control (QA/QC) program.

   Upon written approval of the alternative monitoring method and/or analytical instruments, these methods or instruments must be consistently utilized throughout the monitoring period. DEQ must be notified in writing and the permittee must receive written approval from DEQ if the permittee decides to return to the original permit monitoring requirements.

4. Best Management Practices (BMPs), as defined in Part IV.7, must be implemented for the facility to prevent or reduce the pollution of waters of the State from stormwater runoff, spills or leaks, and/or waste disposal. The permittee must amend the BMPs whenever there is a change in the facility or a change in the operation of the facility.

5. Discharge flow for Outfall 001 is to be calculated based on pump capacity and run times plus the sum of all other contributing flows (Internal Outfalls 002, 003, 004, and 005).

6. There shall be no discharge of polychlorinated biphenol compounds such as those used for transformer fluid.

7. Monthly average temperature reported in the discharge monitoring reports (DMRs) for each month is defined as the average of the temperature measurements taken at equal time intervals not greater than two hours over the course of a calendar month. The daily maximum temperature reported in the discharge monitoring reports (DMRs) for each month shall be the highest daily average temperature computed during the month. Daily average temperature is defined as the average of the temperature measurements taken at equal time intervals not greater than two hours over the course of a calendar day.

8. The term "Free Available Oxidants" shall mean the value obtained using any of the EPA approved "chlorine-free available" methods listed in Table IB in 40 C.F.R. § 136.3(a) or other EPA approved alternate test methods to those listed in 40 C.F.R. § 136.3(a).

   Free available oxidants may not be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available oxidants at any one time unless the discharger demonstrates to the permitting authority that the units in a particular location cannot operate at or below the limits specified in this permit.

9. The term "Total Residual Oxidants" means the value obtained using any of the EPA approved "chlorine-total residual" methods listed in Table IB in 40 C.F.R. § 136.3(a) or other EPA approved alternate test methods to those listed in 40 C.F.R. § 136.3(a).

   Total residual oxidants may not be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge total residual oxidants at any one time unless the permittee demonstrates to the permitting authority that the units in a particular location cannot operate at or below the limits specified in this permit.

10. The term "low volume waste sources" means, taken collectively as if from one source, wastewater from all sources except those for which specific limitations or standards are otherwise established in 40 C.F.R. Part 423. Low volume waste sources include, but are not limited to, the following: Wastewaters from ion exchange water treatment systems, water treatment evaporator blowdown, laboratory and sampling streams, boiler blowdown, floor drains, cooling tower basin cleaning wastes, recirculating house service water systems, and wet scrubber air pollution control systems whose primary purpose is particulate removal. Sanitary wastes, air conditioning wastes, and wastewater from carbon capture or sequestration systems are not included in this definition.

11. The discharge from Internal Outfall 002 (cooling tower blowdown) shall have no detectable amount of the 126 priority pollutants listed in Appendix A to 40 C.F.R. Part 423 (contained in chemicals added for cooling tower maintenance), except for Chromium and Zinc. "No detectable amount" means undetectable when analyzed in accordance with the analytical

methods in 40 C.F.R. Part 136. Limits for Chromium and Zinc are included in Part IA, Section A2.

Chemicals containing any of the 126 priority pollutants in Appendix A of 40 C.F.R. Part 423, including Chromium and Zinc, cannot be used for cooling tower maintenance without the prior approval of the Division. The permit may be reopened to include additional effluent limitations and monitoring requirements as part of Division approval.

Requirements to monitor the discharge at Internal Outfall 002 for all 126 priority pollutants listed in Appendix A of 40 C.F.R. Part 423, including Chromium and Zinc, is waived during this permit term based on 40 C.F.R. § 122.44(a)(2) and a certification dated August 15, 2018 from the facility that no cooling tower maintenance chemicals containing any priority pollutant are used at the facility. This waiver is only valid for the term of this permit. The permittee must request this monitoring waiver when applying for a reissued permit in order to have the monitoring waived during the term of the reissued permit. The monitoring waiver request must be accompanied by a signed certification that the facility does not use any cooling tower maintenance chemicals that contain the priority pollutant listed in Appendix A of 40 C.F.R. Part 423 for which the monitoring waiver is being sought. The signed certification shall include the statements in 40 C.F.R. § 122.22(d).

12. Stormwater runoff commingling with other process wastewater discharged from Outfall 001, 006, 009, 010, 011, 012, and 013 shall be managed in accordance with Best Management Practices (BMPs) in the form of a stormwater pollution prevention plan (SWPPP) required by the Arkansas Industrial General Stormwater Permit ARR00000 to control the quality of stormwater discharges associated with industrial activity that is authorized by this permit. Use of BMPs in lieu of numeric effluent limitations in NPDES permits is authorized under 40 C.F.R. § 122.44(k) when the permitting authority finds numeric effluent limitations to be infeasible to carry out the purposes of the Clean Water Act.

13. The permittee may use any EPA approved method based on 40 C.F.R. Part 136 provided the minimum quantification level (MQL) for the chosen method is equal to or less than what has been specified in chart below:

Pollutant	MQL (µg/l)
Total Recoverable Arsenic	0.5

The permittee may develop a matrix specific method detection limit (MDL) in accordance with Appendix B of 40 C.F.R. Part 136. For any pollutant for which the permittee determines a site specific MDL, the permittee shall send to DEQ, NPDES Permits Branch, a report containing QA/QC documentation, analytical results, and calculations necessary to demonstrate that a site specific MDL was correctly calculated. A site specific MQL shall be determined in accordance with the following calculation:

$$MQL = 3.3 \times MDL$$

Upon written approval by Permits Branch, the site specific MQL may be utilized by the permittee for all future DMR calculations and reporting requirements.

14. WHOLE EFFLUENT TOXICITY TESTING (7 DAY CHRONIC NOEC)

It is unlawful and a violation of this permit for a permittee or his designated agent to manipulate test samples in any manner, to delay sample shipment, or to terminate or to cause to terminate a toxicity test. Once initiated, all toxicity tests must be completed unless specific authority has been granted by EPA Region 6 or the State NPDES permitting authority (DEQ).

A. SCOPE AND METHODOLOGY

i. The permittee shall test the effluent for toxicity in accordance with the provisions in this section.

Applicable To Final Outfall(S)	001
Reported On DMR As Final Outfall	001
Critical Dilution (%)	100
Effluent Dilution Series (%)	32, 42, 56, 75, 100
Testing Frequency:	Once/Quarter
Sample Type	"Composite Sample (defined in Paragraph B.iii)"
Test Species/Methods:	40 C.F.R. § 136

Ceriodaphnia dubia chronic static renewal survival and reproduction test, Method 1002.0, EPA-821-R-02-013, or the most recent update thereof.

Pimephales promelas (Fathead minnow) chronic static renewal 7-day larval survival and growth test, Method 1000.0, EPA-821-R-02-013, or the most recent update thereof.

ii. The NOEC (No Observed Effect Concentration) is herein defined as the greatest effluent dilution at and below which toxicity that is statistically different from the control (0% effluent) at the 95% confidence level does not occur. Chronic lethal test failure is defined as a demonstration of a statistically significant lethal effect at test completion to a test species at or below the critical dilution. Chronic sub-lethal test failure is defined as a demonstration of a statistically significant sub-lethal effect (i.e., growth or reproduction) at test completion to a test species at or below the critical dilution.

iii. This permit may be reopened to require WET limits, chemical specific effluent limits, additional testing, and/or other appropriate actions to address toxicity.

B. REQUIRED TEST ACCEPTABILITY CRITERIA AND TEST CONDITIONS

The permittee shall repeat a test, including the control and all effluent dilutions, if the

procedures and quality assurance requirements defined in the test methods or in this permit are not satisfied, including the following additional criteria:

Condition/Criteria	***Ceriodaphnia dubia***	***Pimephales promelas***
Test Duration	Until 60% or more of surviving control females have 3 broods (max 8 days)	7 days
# of replicates per concentration	10	5
# of organisms per replicate	1	8
# of organisms per concentration	10	40 (minimum)
# of test concentrations per effluent	5 and a control	5 and a control
Sample Holding Time *	36 hours for first use	36 hours for first use
Sampling Requirement *	Minimum of 3 samples	Minimum of 3 samples
Test Acceptability Criteria	≥80% survival of all control organisms.	≥80% survival of all control organisms.
	Mean of 15 or more neonates per surviving control female.	Mean dry weight per surviving organism in control must be ≥0.25mg.
	60% of surviving control females must produce 3 broods.	
Coefficient of Variation **	40% or less, unless significant effects are exhibited.	40% or less unless significant effects are exhibited.
Percent Minimum Significant Difference (PMSD range) for Sub-lethal Endpoint **	13 – 47	12 - 30

* If the flow from the outfall(s) being tested ceases during the collection of effluent samples, the requirements for the minimum number of effluent samples and the minimum number of effluent portions are waived during that sampling period. However, the permittee must collect an effluent composite sample volume during the period of discharge that is sufficient to complete the required toxicity tests with daily renewal of effluent, and must meet the holding time between collection and first use of the sample. When possible, the effluent samples used for the toxicity tests shall be collected on separate days. The effluent composite sample collection duration and the static renewal protocol associated with the abbreviated sample collection must be documented in the full report required in Item C of this section.

** Test failure may not be construed or reported as invalid due to a coefficient of variation value of greater than 40%, or a PMSD value greater than the higher value on the range provided.

i. Statistical Interpretation

The statistical analyses used to determine if there is a significant difference between the control and the critical dilution shall be in accordance with the methods for determining the No Observed Effect Concentration (NOEC) as described in the appropriate method manual listed in Part II or the most recent update thereof.

ii. Dilution Water

a. Dilution water used in the toxicity tests will be receiving water collected as close to the point of discharge as possible but unaffected by the discharge. The permittee shall substitute synthetic dilution water of similar pH, hardness, and alkalinity to the closest downstream perennial water for;

(1) toxicity tests conducted on effluent discharges to receiving water classified as intermittent streams; and

(2) toxicity tests conducted on effluent discharges where no receiving water is available due to zero flow conditions.

b. If the receiving water is unsatisfactory as a result of instream toxicity (fails to fulfill the test acceptance criteria), the permittee may substitute synthetic dilution water for the receiving water in all subsequent tests provided the unacceptable receiving water test met the following stipulations:

(1) a synthetic dilution water control which fulfills the test acceptance requirements was run concurrently with the receiving water control;

(2) the test indicating receiving water toxicity has been carried out to completion,

(3) the permittee includes all test results indicating receiving water toxicity with the full report and information required; and

(4) the synthetic dilution water shall have a pH, hardness, and alkalinity similar to that of the receiving water or closest downstream perennial water not adversely affected by the discharge, provided the magnitude of these parameters will not cause toxicity in the synthetic dilution water.

iii. Samples and Composites

a. The permittee shall collect a minimum of three samples (flow-weighted composite if possible) from the outfall(s).

b. The permittee shall collect a second and third sample (composite samples if possible) for use during the 24-hour renewal of each dilution concentration for each test. The permittee must collect the composite samples so that the maximum holding time for any effluent sample shall not exceed 36 hours for first use of the sample. The permittee must have initiated the toxicity test within 36 hours after the collection of the last portion of the first composite sample. Samples shall be chilled to 0-6 degrees Centigrade during collection, shipping, and/or storage. A holding time up to 72 hours is allowed upon notification to DEQ of the need for additional holding time.

c. The permittee must collect the composite samples such that the effluent samples are representative of the discharge duration, and of any periodic episode of chlorination, biocide usage or other potentially toxic substance discharged on an intermittent basis.

C. REPORTING

i. The permittee shall prepare a full report of the results of all tests conducted pursuant to this part in accordance with the Report Preparation Section of the most current publication of the method manual, for every valid or invalid toxicity test initiated, whether carried to completion or not. The permittee shall retain each full report and submit them to the Agency via NetDMR. For any test which fails, is considered invalid, or which is terminated early for any reason, the full report must be submitted for agency review.

ii. A valid test for each species must be reported during each reporting period specified in PART I of this permit unless the permittee is performing a TRE which may increase the frequency of testing and reporting. One set of biomonitoring data for each species is to be recorded on the DMR for each reporting period. Additional results are reported under the retest codes below.

iii. The permittee shall submit the results of each valid toxicity test on the subsequent DMR for that reporting period as follows below. Submit retest information clearly marked as such with the subsequent DMR. Only results of valid tests are to be reported on the DMR.

Reporting Requirement	**Parameter STORET CODE**	
	Ceriodaphnia dubia	*Pimephales promelas*
Enter a “1” if the No Observed Effect Concentration (NOEC) for survival is less than the critical dilution, otherwise enter a "0".	TLP3B	TLP6C

Reporting Requirement	Parameter STORET CODE	
	Ceriodaphnia dubia	*Pimephales promelas*
Report the NOEC value for survival	TOP3B	TOP6C
Enter a "1" if the NOEC for growth or reproduction is less than the critical dilution, otherwise enter a "0".	TGP3B	TGP6C
Report the NOEC value for growth or reproduction	TPP3B	TPP6C
Report the highest (critical dilution or control) Coefficient of Variation	TQP3B	TQP6C
(If required) Retest 1 – Enter a "1" if the NOEC for survival, growth or reproduction is less than the critical dilution, otherwise enter "0". (reported on quarterly DMR)*	22415	22418
(If required) Retest 2- Enter a "1" if the NOEC for survival, growth or reproduction is less than the critical dilution, otherwise enter "0". (reported on quarterly DMR)*	22416	22419
(If required) Retest 3- Enter a "1" if the NOEC for survival, growth or reproduction is less than the critical dilution, otherwise enter "0". (reported on quarterly DMR)*	51443	51444

* If retests are not required, Report NODI=9 (Conditional Monitoring - Not Required This Period).

iv. DMR parameters

Report the following parameters on the DMR:

Scheduled DMR: TLP6C, TOP6C, TPP6C, TGP6C, TQP6C, 22418, 22419, 51444, TLP3B, TOP3B, TPP3B, TGP3B, TQP3B, 22415, 22416, and 51443.

D. MONITORING FREQUENCY REDUCTION

i. The permittee may apply for a testing frequency reduction upon the successful completion of the first four consecutive quarters of testing for a test species, with no lethal or sub-lethal effects demonstrated at or below the critical dilution. If granted, the monitoring frequency for that test species may be reduced to not less once per six months.

ii. Certification - The permittee must certify in writing that no test failures have occurred and that all tests meet all test acceptability criteria above. In addition, the permittee must

provide a list with each test performed including test initiation date, species, and NOECs. Upon review and acceptance of this information, the agency will issue a letter of confirmation of the monitoring frequency reduction. A copy of the letter will be forwarded to the agency's compliance section to update the permit reporting requirements.

iii. Failures - If any test demonstrates lethal or sub-lethal effects at or below the critical dilution at any time during the life of this permit, three monthly retests are required. If a frequency reduction had been granted, the monitoring frequency for the affected test species reverts to once per quarter until the permit is re-issued.

iv. This monitoring frequency reduction applies only until the expiration date of this permit, at which time the monitoring frequency for both test species reverts to once per quarter until the permit is re-issued.

v. For administratively continued facilities where permit renewal was held up by no fault of the permittee, the following language regarding WET testing frequency reduction applies after permit renewal:

The permittee may apply for a testing frequency reduction upon the successful completion of the first four consecutive quarters of testing after the expiration date of the previous permit, for one or both test species, provided that all of the following conditions are met:

a. The permittee tested quarterly upon the expiration date of that permit, and

b. The issuance of the renewed permit was not delayed by any fault of the permittee, and

c. No lethal or sub-lethal effects are demonstrated at or below the critical dilution for the first four consecutive quarters of testing after the expiration date of the previous permit.

E. PERSISTENT TOXICITY

The requirements of this subsection apply only when a toxicity test demonstrates significant lethal and/or sub-lethal effects at or below the critical dilution. Significant toxic effects are herein defined as a statistically significant difference at the 95% confidence level between the survival, growth or reproduction of the appropriate test organism in a specified effluent dilution and the control (0% effluent). If the initial WET test conducted fails, the permittee will conduct three consecutively monthly retests. The purpose of retests is to determine the duration of a toxic event. A test that meets all test acceptability criteria and demonstrates significant toxic effects does not need additional confirmation. Such testing cannot confirm or disprove a previous test result.

i. Retest

The permittee shall conduct a total of three (3) additional tests for any species that demonstrates significant effects at or below the critical dilution. The three additional tests shall be conducted monthly (one test per month) during the next three consecutive months. If testing on a quarterly basis, the permittee may substitute one of the additional tests in lieu of one routine toxicity test. A full report shall be prepared for each test required by this section in accordance with the reporting requirements previously outlined and submitted to the Agency.

ii. Requirement to Initiate a Toxicity Reduction Evaluation

If persistent lethality is demonstrated by failure of one or more retests, the permittee shall initiate Toxicity Reduction Evaluation (TRE) requirements as specified in Part F of this section. If persistent sub-lethality is demonstrated by failure of two or more retests, the permittee shall initiate Toxicity Reduction Evaluation (TRE) requirements. The permittee shall notify DEQ in writing within 5 days of notification of the failure of any retest, and the TRE initiation date will be the test completion date of the first failed retest for lethal TREs or second failed retest for sub-lethal TREs. A TRE may also be required due to a demonstration of intermittent effects at or below the critical dilution, or for failure to perform the required retests.

F. TOXICITY REDUCTION EVALUATION (TRE)

EPA Region 6 is currently addressing TREs as follows: A TRE is triggered following three sub-lethal test failures (a failure followed by two retest failures) or two test failures with lethal effects (a failure followed by one retest failure).

i. Within ninety (90) days of confirming lethality and/or sub-lethality in the retests, the permittee shall submit a Toxicity Reduction Evaluation (TRE) Action Plan and Schedule for conducting a TRE to DEQ. The TRE Action Plan shall specify the approach and methodology to be used in performing the TRE. A TRE is an investigation intended to determine those actions necessary to achieve compliance with water quality based effluent limits by reducing an effluent's toxicity to an acceptable level. A TRE is defined as a step wise process which combines toxicity testing and analyses of the physical and chemical characteristics of a toxic effluent to identify the constituents causing effluent toxicity and/or treatment methods which will reduce the effluent toxicity. The TRE Action Plan shall lead to the successful elimination of effluent toxicity at the critical dilution and include the following:

a. Specific Activities. The plan shall detail the specific approach the permittee intends to utilize in conducting the TRE. The approach may include toxicity characterizations, a Toxicity Identification Evaluation (TIE) and confirmation activities, source evaluation, treatability studies, or alternative approaches. When the permittee conducts Toxicity Identification Evaluations to characterize the

nature of the constituents causing toxicity, the permittee shall perform multiple characterizations and follow the procedures specified in the documents "Methods for Aquatic Toxicity Identification Evaluations: Phase I Toxicity Characterization Procedures" (EPA 600/6-91/003) or alternate procedures. When the permittee conducts Toxicity Identification Evaluations and Confirmations, the permittee shall perform multiple identifications and follow the methods specified in the documents "Methods for Aquatic Toxicity Identification Evaluations, Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity" (EPA/600/R-92/080) and "Methods for Aquatic Toxicity Identification Evaluations, Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity" (EPA/600/R-92/081), as appropriate.

b. Sampling Plan (e.g., locations, methods, holding times, chain of custody, preservation, etc.). The effluent sample volume collected for all tests shall be adequate to perform the toxicity test, toxicity characterization, identification and confirmation procedures, and conduct chemical specific analyses when a probable toxicant has been identified; Where the permittee has identified or suspects specific pollutant(s) and/or source(s) of effluent toxicity, the permittee shall conduct, concurrent with toxicity testing, chemical specific analyses for the identified and/or suspected pollutant(s) and/or source(s) of effluent toxicity. Where toxicity was demonstrated within 24 hours of test initiation, each composite sample shall be analyzed independently. Otherwise the permittee may substitute a composite sample, comprised of equal portions of the individual composite samples, for the chemical specific analysis;

c. Quality Assurance Plan (e.g., QA/QC implementation, corrective actions, etc.); and

d. Project Organization (e.g., project staff, project manager, consulting services, etc.).

ii. The permittee shall initiate the TRE Action Plan within thirty (30) days of plan and schedule submittal.

iii. The permittee shall submit a quarterly TRE Activities Report to DEQ in the months of January, April, July and October, containing information on toxicity reduction evaluation activities including:

a. Any data and/or substantiating documentation which identifies the pollutant(s) and/or source(s) of effluent toxicity;

b. Any studies/evaluations and results on the treatability of the facility’s effluent toxicity; and

c. Any data which identifies effluent toxicity control mechanisms that will reduce effluent toxicity to the level necessary to meet no significant toxicity at the critical dilution. A copy of the TRE Activities Report shall also be submitted to the state agency.

d. Any results and interpretation of any chemical specific analysis, and for any characterization, identification, and confirmation tests performed during the quarter.

e. Any changes to the initial TRE plan and schedule that are believed necessary.

iv. Finalizing a TRE

The permittee shall submit (to DEQ) a final report on TRE activities no later than twenty-eight (28) months from confirming toxicity in the retests, which provides information pertaining to the specific control mechanism selected that will, when implemented, result in reduction of effluent toxicity to no significant toxicity at the critical dilution. The report will also provide a specific corrective action schedule for implementing the selected control mechanism. A copy of the final report on TRE Activities shall also be submitted to the state agency.

A TRE may be stopped if there is no toxicity at the critical dilution for a period of 12 consecutive months (with at least monthly testing) following confirmation of toxicity in the retests. The permittee would submit a final report to DEQ at that time.

v. Quarterly testing during the TRE is a minimum monitoring requirement. EPA recommends that permittees required to perform a TRE not rely on quarterly testing alone to ensure success in the TRE, and that additional screening tests be performed to capture toxic samples for identification of toxicants. Failure to identify the specific chemical compound causing toxicity test failure will normally result in a permit limit for whole effluent toxicity limits per federal regulations at 40 C.F.R. § 122.44(d)(1)(v).

G. OPTIONAL SIDE-BY-SIDE CHRONIC WET TESTING

The permittee has the option to conduct side-by-side testing using effluent and effluent treated by exposure to UV light to remove or inactivate pathogens, when pathogenic interference is suspected. Documentation specifying the date, time, duration, and UV sterilization equipment used, should be included with any UV treated WET test. The results of both tests should be reported to the Division.

Clean Water Act Section 316(b) Conditions

15. Cooling Water Intake Structures (CWIS)

The permittee shall operate the cooling water intake structure for Units 1 and 2 based on the current design and location to minimize impingement mortality and entrainment of aquatic organisms. This will meet the site-specific BTA Standards for Impingement Mortality and Entrainment as required by 40 C.F.R. § 125.94(c) and (d), respectively.

16. Barrier Net

The permittee shall operate a barrier net near the mouth of the intake canal as a component of the system of technologies for reducing impingement on the intake screens. The barrier net shall only be deployed from October 1st through April 1st in accordance with U.S. Corps of Engineers Nationwide Permit No. 1967-00241-14. The barrier net can be installed and uninstalled anytime from October 1st through April 1st provided the net is deployed a minimum period of 169 days from October 1st through April 1st.

17. Closed Cycle Recirculating Cooling System

The permittee shall operate a closed cycle recirculating cooling system for Unit 2, as defined at 40 C.F.R. § 125.92(c). In addition, the permittee shall monitor the actual intake flow at Unit 2 at a minimum frequency of daily. The monitoring must be representative of normal operating conditions, and must include measuring cooling water withdrawals, make-up water, and blowdown volume.

18. Visual inspections for the CWIS

A. In accordance with 40 C.F.R. § 125.96(e), visual inspections of the barrier net shall be conducted at least weekly during periods of net deployment, and visual inspections of the intake canal shall be conducted at least weekly when the CWIS is in operation, to ensure that the system of technologies operated to comply with 40 C.F.R. § 125.94(c)(6) for Unit 1, and 40 C.F.R. § 125.94(c)(1) for Unit 2, are maintained and operated to function as designed.

B. In accordance with 40 C.F.R. § 125.96(a) and (b), visual inspections of the traveling screens for Units 1 and 2, shall be conducted at least daily when the CWIS is in operation to ensure that the system of technologies operated to comply with 40 C.F.R. § 125.94(c)(6) for Unit 1, and 40 C.F.R. § 125.94(c)(1) for Unit 2, are maintained and operated to function as designed. The screens shall be rotated and cleaned as needed to maintain screen open area.

19. Reporting requirements for the CWIS

    In accordance with 40 C.F.R. § 125.97(a), documentation of the daily visual inspections of the traveling screens for Units 1 and 2, the weekly visual inspections of the barrier net and intake canal, and the daily actual intake flow for Unit 2, shall be submitted with each Discharge Monitoring Report (DMR).

20. Recordkeeping requirements for the CWIS

    A. In accordance with 40 C.F.R. § 125.97(f), all records supporting DEQ's Determination of BTA for Entrainment under 40 C.F.R. § 125.98(f) must be retained at the facility until such time as DEQ revises the Determination of BTA for Entrainment in the permit.

    B. In accordance with 40 C.F.R. § 125.97(d), records of all submissions that are part of the permit reporting requirements (daily screen inspections, daily intake flow for Unit 2, and weekly inspections of barrier net and intake canal) must be retained by the permittee until the subsequent permit is issued.

21. In accordance with 40 C.F.R. § 125.98(b)(1), nothing in this permit authorizes take for the purposes of a facility's compliance with the Endangered Species Act.

22. Cooling Water Intake Structure (CWIS) Annual Certification Statement and Report

    In accordance with 40 C.F.R. § 125.97(c), the permittee shall submit an annual certification statement and report to the Division (NPDES Permits Branch) each year by the anniversary date of the effective date of the permit. The certification statement and report must be signed by the Responsible Official for the permit.

    A. The report must include a summary of any modifications to, or changes in the operation of, the CWIS at your facility that impacts cooling water withdrawals. In addition, any revisions to the information required in 40 C.F.R. § 122.21(r) must be submitted with the next permit renewal application.

    B. If the information contained in the previous year's annual certification statement and report is still pertinent, a letter stating such, signed by the Responsible Official for the permit, may be submitted to the Division (NPDES Permits Branch), along with any applicable data. The letter will meet the requirements of this part for an annual certification statement and report.

PART III
STANDARD CONDITIONS

SECTION A – GENERAL CONDITIONS

1. **Duty to Comply**

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the federal Clean Water Act and the Arkansas Water and Air Pollution Control Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; and/or for denial of a permit renewal application. **Any values reported in the required Discharge Monitoring Report (DMR) which are in excess of an effluent limitation specified in Part I shall constitute evidence of violation of such effluent limitation and of this permit.**

2. **Penalties for Violations of Permit Conditions**

The Arkansas Water and Air Pollution Control Act provides that any person who violates any provisions of a permit issued under the Act shall be guilty of a misdemeanor and upon conviction thereof shall be subject to imprisonment for not more than one (1) year, or a fine of not more than twenty-five thousand dollars ($25,000) or by both such fine and imprisonment for each day of such violation. Any person who violates any provision of a permit issued under the Act may also be subject to civil penalty in such amount as the court shall find appropriate, not to exceed ten thousand dollars ($10,000) for each day of such violation. The fact that any such violation may constitute a misdemeanor shall not be a bar to the maintenance of such civil action.

3. **Permit Actions**

This permit may be modified, revoked and reissued, or terminated for cause including, but not limited to the following:

A. Violation of any terms or conditions of this permit.
B. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts.
C. A change in any conditions that requires either a temporary or permanent reduction or elimination of the authorized discharge.
D. A determination that the permitted activity endangers human health or the environment and can only be regulated to acceptable levels by permit modification or termination.
E. Failure of the permittee to comply with the provisions of APC&EC Rule 9 (Permit fees) as required by Part III.A.11 herein.

The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

4. **Toxic Pollutants**

Notwithstanding Part III.A.3, if any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under APC&EC Rule 2, as amended, or Section 307(a) of the Clean Water Act for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitations on the pollutant in this permit, this permit shall be modified or revoked and reissued to conform to the toxic effluent standards or prohibition and the permittee so notified.

The permittee shall comply with effluent standards, narrative criteria, or prohibitions established under APC&EC Rule 2, as amended, or Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

5. **Civil and Criminal Liability**

Except as provided in permit conditions for "Bypass of Treatment Facilities" (Part III.B.4), and "Upset" (Part III.B.5), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance. Any false or materially misleading representation or concealment of information required to be reported by the provisions of this permit or applicable state and federal statutes or regulations which defeats the regulatory purposes of the permit may subject the permittee to criminal enforcement pursuant to the Arkansas Water and Air Pollution Control Act (Ark. Code Ann. § 8-4-101 et seq.).

6. **Oil and Hazardous Substance Liability**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject to under Section 311 of the Clean Water Act.

7. **State Laws**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Clean Water Act.

8. **Property Rights**

The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.

9. **Severability**

The provisions of this permit are severable, and if any provision of this permit, or the application of any provisions of this permit to any circumstance is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

10. **Applicable Federal, State or Local Requirements**

Permittees are responsible for compliance with all applicable terms and conditions of this permit. Receipt of this permit does not relieve any operator of the responsibility to comply with any other applicable federal requirements such as endangered species, state or local statute, ordinance or regulation.

11. **Permit Fees**

The permittee shall comply with all applicable permit fee requirements (i.e., including annual permit fees following the initial permit fee that will be invoiced every year the permit is active) for wastewater discharge permits as described in APC&EC Rule 9 (Rule for the Fee System for Environmental Permits). Failure to promptly remit all required fees shall be grounds for the Director to initiate action to terminate this permit under the provisions of 40 C.F.R. §§ 122.64 and 124.5(d), as adopted in APC&EC Rule 6 and the provisions of APC&EC Rule 8.

SECTION B – OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. **Proper Operation and Maintenance**

A. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

B. The permittee shall provide an adequate operating staff which is duly qualified to carryout operation, maintenance, and testing functions required to ensure compliance with the conditions of this permit.

2. **Need to Halt or Reduce not a Defense**

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. Upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production or discharges or both until the facility is restored or an alternative method of treatment is provided.

This requirement applies, for example, when the primary source of power for the treatment facility is reduced, is lost, or alternate power supply fails.

3. **Duty to Mitigate**

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment or the water receiving the discharge.

4. **Bypass of Treatment Facilities**

"Bypass" means the intentional diversion of waste streams from any portion of a treatment facility, as defined at 40 C.F.R. § 122.41(m)(1)(i).

A. Bypass not exceeding limitation

The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Parts III.B.4.B and 4.C.

B. Notice

1. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.
2. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in Part III.D.6 (24-hour notice).

C. Prohibition of bypass

1. Bypass is prohibited and the Director may take enforcement action against a permittee for bypass, unless:

(a) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if the permittee could have installed adequate backup equipment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
(c) The permittee submitted notices as required by Part III.B.4.B.

2. The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in Part III.B.4.C(1).

5. **Upset Conditions**

A. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of Part III.B.5.B of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

B. Conditions necessary for demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that the permittee can identify the specific cause(s) of the upset.
2. The permitted facility was at the time being properly operated.
3. The permittee submitted notice of the upset as required by Part III.D.6.
4. The permittee complied with any remedial measures required by Part III.B.3.

C. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

6. **Removed Substances**

A. Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering waters of the State. The Permittee must comply with all applicable state and Federal regulations governing the disposal of sludge, including but not limited to 40 C.F.R. Parts 257, 258, and 503.

B. Any changes to the permittee's disposal practices described in the Fact Sheet, as derived from the permit application, will require at least 180 days prior notice to the Director to allow time for additional permitting. Please note that the 180 day notification requirement may be waived if additional permitting is not required for the change.

7. **Power Failure**

The permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated or inadequately treated wastes during electrical power failure either by means of alternate power sources, standby generators, or retention of inadequately treated effluent.

SECTION C – MONITORING AND RECORDS

1. **Representative Sampling**

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge during the entire monitoring period. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points shall not be changed without notification to and the approval of the Director. Intermittent discharge shall be monitored.

2. **Flow Measurement**

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated, and maintained to ensure the accuracy of the measurements are consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than +/- 10% from true discharge rates throughout the range of expected discharge volumes and shall be installed at the monitoring point of the discharge.

Calculated Flow Measurement

For calculated flow measurements that are performed in accordance with either the permit requirements or a Division approved method (i.e., as allowed in the *Other Specified Monitoring Requirements* condition under Part II), the +/- 10% accuracy requirement described above is waived. This waiver is only applicable when the method used for calculation of the flow has been reviewed and approved by the Division.

3. **Monitoring Procedures**

Monitoring must be conducted according to test procedures approved under 40 C.F.R. Part 136, unless other test procedures have been specified in this permit. The permittee shall calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals frequent enough to ensure accuracy of measurements and shall ensure that both calibration and maintenance activities will be conducted. An adequate analytical quality control program, including the analysis of sufficient standards, spikes, and duplicate samples to ensure the accuracy of all required analytical results shall be maintained by the permittee or designated commercial laboratory. At a minimum, spikes and duplicate samples are to be analyzed on 10% of the samples.

4. **Penalties for Tampering**

The Arkansas Water and Air Pollution Control Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under the Act shall be guilty of a misdemeanor and upon conviction thereof

shall be subject to imprisonment for not more than one (1) year or a fine of not more than ten thousand dollars ($10,000) or by both such fine and imprisonment.

5. **Reporting of Monitoring Results**

40 C.F.R. § 127.11(a)(1) and 40 C.F.R. § 127.16(a) require that monitoring reports must be reported on a Discharge Monitoring Reports (DMR) and filed electronically. Signatory Authorities must initially request access for a NetDMR account. Once a NetDMR account is established, access to electronic filing should use the following link https://cdx.epa.gov. Permittees who are unable to file electronically may request a waiver from the Director in accordance with 40 C.F.R. § 127.15. Monitoring results obtained during the previous monitoring period shall be summarized and reported on a DMR dated and submitted no later than the 25th day of the month, following the completed reporting period beginning on the effective date of the permit.

6. **Additional Monitoring by the Permittee**

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 C.F.R. Part 136 or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR. Such increased frequency shall also be indicated on the DMR.

7. **Retention of Records**

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit for a period of at least 3 years from the date of the sample, measurement, report, or application. This period may be extended by request of the Director at any time.

8. **Record Contents**

Records and monitoring information shall include:

A. The date, exact place, time and methods of sampling or measurements, and preservatives used, if any.
B. The individual(s) who performed the sampling or measurements.
C. The date(s) and time analyses were performed.
D. The individual(s) who performed the analyses.
E. The analytical techniques or methods used.
F. The measurements and results of such analyses.

9. **Inspection and Entry**

The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

A. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit.
B. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit.
C. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit.
D. Sample, inspect, or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

SECTION D – REPORTING REQUIREMENTS

1. **Planned Changes**

The Permittee shall give notice to the Director as soon as possible but no later than 180 days prior to any planned physical alterations or additions to the permitted facility [40 C.F.R. § 122.41(l)]. Notice is required only when:

A. The alteration or addition to a permitted facility may meet one of the criteria for new sources at 40 C.F.R. § 122.29(b).
B. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants subject to effluent limitations in the permit, or to the notification requirements under 40 C.F.R.§ 122.42(b).

2. **Anticipated Noncompliance**

The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

3. **Transfers**

The permit is nontransferable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Act.

4. **Monitoring Reports**

Monitoring results shall be reported at the intervals and in the form specified in Part III.C.5. **Discharge Monitoring Reports must be submitted even when no discharge occurs during the reporting period.**

5. **Compliance Schedule**

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date. Any reports of noncompliance shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

6. **Twenty-four Hour Report**

Please be aware that the notifications can be sent by email to water-enforcement-report@adeq.state.ar.us or at 501-682-0624 for immediate reporting:

A. The permittee shall report any noncompliance which may endanger health or the environment within 24 hours from the time the permittee becomes aware of the circumstances to the Enforcement Branch of the Office of Water Quality of DEQ. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain the following information:

1. A description of the noncompliance and its cause.
2. The period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue.
3. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

B. The following must be reported within 24 hours:

1. Any unanticipated bypass which exceeds any effluent limitation in the permit.
2. Any upset which exceeds any effluent limitation in the permit.
3. Violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in Part I of the permit.

C. The Director may waive the written report on a case-by-case basis if the notification has been received within 24 hours to the Enforcement Branch of the Office of Water Quality of the DEQ.

7. **Other Noncompliance**

The permittee shall report all instances of noncompliance not reported under Parts III.D.4, 5, and 6, at the time monitoring reports are submitted. The reports shall contain the information listed at Part III.D.6.

8. **Changes in Discharge of Toxic Substances for Industrial Dischargers including Existing Manufacturing, Commercial, Mining, and Silvicultural Dischargers**

The Director shall be notified as soon as the permittee knows or has reason to believe:

A. That any activity has occurred or will occur which would result in the discharge on a routine or frequent basis of any toxic pollutant including those listed in 40 C.F.R. § 401.15 which is not limited in the permit, if that discharge will exceed the highest of the "notification levels" described in 40 C.F.R. § 122.42(a)(1).

B. That any activity has occurred or will occur which would result in any discharge on a non-routine or infrequent basis of a toxic pollutant including those listed in 40 C.F.R. § 401.15 which is not limited in the permit, if that discharge will exceed the highest of the "notification levels" described in 40 C.F.R. § 122.42(a)(2).

9. **Duty to Provide Information**

The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit. Information shall be submitted in the form, manner and time frame requested by the Director.

10. **Duty to Reapply**

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The complete application shall be submitted at least 180 days before the expiration date of this permit. The Director may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date. Continuation of expiring permits shall be implemented through procedures outlined by APC&EC Rule 6.

11. **Signatory Requirements**

All applications, reports, or information submitted to the Director shall be signed and certified as follows:

A. All **permit applications** shall be signed as follows:

1. For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

(a) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation.

(b) The manager of one or more manufacturing, production, or operation facilities, provided: the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

2. For a partnership or sole proprietorship: by a general partner or proprietor, respectively.

3. For a municipality, State, Federal, or other public agency, by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(a) The chief executive officer of the agency.
(b) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.

B. All **reports** required by the permit and **other information** requested by the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1. The authorization is made in writing by a person described above.
2. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility. (A duly authorized representative may thus be either a named individual or any individual occupying a named position).
3. The written authorization is submitted to the Director.

C. Certification. Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

12. **Availability of Reports**

Except for data determined to be confidential under 40 C.F.R. Part 2 and APC&EC Rule 6, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Division of Environmental Quality. As required by the Rules, the name and address of any permit applicant or permittee, permit applications, permits, and effluent data shall not be considered confidential.

13. **Penalties for Falsification of Reports**

The Arkansas Air and Water Pollution Control Act provides that any person who knowingly makes any false statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under this permit shall be subject to civil penalties specified in Part III.A.2 and/or criminal penalties under the authority of the Arkansas Water and Air Pollution Control Act (Ark. Code Ann. § 8-4-101 et seq.).

14. **Other Information**

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information.

PART IV
DEFINITIONS

All definitions contained in Section 502 of the Clean Water Act and 40 C.F.R. § 122.2 shall apply to this permit and are incorporated herein by reference. Additional definitions of words or phrases used in this permit are as follows:

1. **"7-Day Average"** also known as "average weekly," means the highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week. The 7-Day Average for Fecal Coliform Bacteria (FCB) or *E. coli* is the geometric mean of the "daily discharges" of all effluent samples collected during a calendar week in colonies per 100 ml.
2. **"Act"** means the Clean Water Act, Public Law 95-217 (33.U.S.C. 1251 et seq.) as amended.
3. **"Administrator"** means the Administrator of the U.S. Environmental Protection Agency.
4. **"APC&EC"** means the Arkansas Pollution Control and Ecology Commission.
5. **"Applicable effluent standards and limitations"** means all State and Federal effluent standards and limitations to which a discharge is subject under the Act, including, but not limited to, effluent limitations, standards of performance, toxic effluent standards and prohibitions, and pretreatment standards.
6. **"Applicable water quality standards"** means all water quality standards to which a discharge is subject under the federal Clean Water Act and which has been (a) approved or permitted to remain in effect by the Administrator following submission to the Administrator pursuant to Section 303(a) of the Act, or (b) promulgated by the Director pursuant to Section 303(b) or 303(c) of the Act, and standards promulgated under (APC&EC) Rule 2, as amended.
7. **"Best Management Practices (BMPs)"** are activities, practices, maintenance procedures, and other management practices designed to prevent or reduce the pollution of waters of the State. BMPs also include treatment technologies, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw sewage. BMPs may include structural devices or nonstructural practices.
8. **"Bypass"** means the intentional diversion of waste streams from any portion of a treatment facility, as defined at 40 C.F.R. § 122.41(m)(1)(i).
9. **"Composite sample"** is a mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing a minimum of 4 effluent portions collected at equal time intervals (but not closer than one hour apart) during operational hours, within the 24-hour period, and combined proportional to flow or a sample collected at more frequent intervals proportional to flow over the 24-hour period.
10. **"CV"** means coefficient of variation.
11. **"Daily Discharge"** means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling.
    A. **Mass Calculations:** For pollutants with limitations expressed in terms of mass, the "daily discharge" is calculated as the total mass of pollutant discharged over the sampling day.
    B. **Concentration Calculations:** For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

12. **"Daily Maximum"** discharge limitation means the highest allowable "daily discharge" during the calendar month.
13. **"Director"** means the Director of the Division of Environmental Quality.
14. **"Dissolved oxygen limit"** shall be defined as follows:
    A. When limited in the permit as a minimum monthly average, shall mean the lowest acceptable monthly average value, determined by averaging all samples taken during the calendar month.
    B. When limited in the permit as an instantaneous minimum value, shall mean that no value measured during the reporting period may fall below the stated value.
15. **"*E. coli*"** a sample consists of one effluent grab portion collected during a 24-hour period at peak loads. For *E. coli*, report the Daily Maximum as the highest "daily discharge" during the calendar month and the Monthly Average as the geometric mean of all "daily discharges" within a calendar month, in colonies per 100 ml.
16. **"Division"** means the Division of Environmental Quality (**DEQ**).
17. **"Fecal Coliform Bacteria (FCB)"** a sample consists of one effluent grab portion collected during a 24-hour period at peak loads. For FCB, report the Daily Maximum as the highest "daily discharge" during the calendar month and the Monthly Average as the geometric mean of all "daily discharges" within a calendar month, in colonies per 100 ml.
18. **"Grab sample"** means an individual sample collected in less than 15 minutes in conjunction with an instantaneous flow measurement.
19. **"Industrial User"** means a nondomestic discharger, as identified in 40 C.F.R. Part 403, introducing pollutants to a publicly owned treatment works (POTW).
20. **"Instantaneous flow measurement"** means the flow measured during the minimum time required for the flow-measuring device or method to produce a result in that instance. To the extent practical, instantaneous flow measurements coincide with the collection of any grab samples required for the same sampling period so that together the samples and flow are representative of the discharge during that sampling period.
21. **"Instantaneous Maximum"** when limited in the permit as an instantaneous maximum value, shall mean that no value measured during the reporting period may fall above the stated value.
22. **"Instantaneous Minimum"** an instantaneous minimum value, shall mean that no value measured during the reporting period may fall below the stated value.
23. **"Monitoring and Reporting"**
    When a permit becomes effective, monitoring requirements are of the immediate period of the permit effective date. Where the monitoring requirement for an effluent characteristic is monthly or more frequently, the Discharge Monitoring Report (DMR) shall be submitted by the 25th of the month following the sampling. Where the monitoring requirement for an effluent characteristic is Quarterly, Semi-Annual, Annual, or Yearly, the DMR shall be submitted by the 25th of the month following the monitoring period end date.
    A. **MONTHLY:**
    is defined as a calendar month or any portion of a calendar month for monitoring requirement frequency of once/month or more frequently.
    B. **BI-MONTHLY:**
    is defined as two (2) calendar months or any portion of 2 calendar months for monitoring requirement frequency of once/2 months or more frequently.

C. **QUARTERLY:**
   1. is defined as a **fixed calendar quarter** or any part of the fixed calendar quarter for a non-seasonal effluent characteristic with a measurement frequency of once/quarter. Fixed calendar quarters are: January through March, April through June, July through September, and October through December.
   2. is defined as a **fixed three month period** (or any part of the fixed three month period) of or dependent upon the seasons specified in the permit for a seasonal effluent characteristic with a monitoring requirement frequency of once/quarter that does not coincide with the fixed calendar quarter. Seasonal calendar quarters are: May through July, August through October, November through January, and February through April.

D. **SEMI-ANNUAL:**
   is defined as the fixed time periods January through June, and July through December (or any portion thereof) for an effluent characteristic with a measurement frequency of once/6 months or twice/year.

E. **ANNUAL or YEARLY:**
   is defined as a fixed calendar year or any portion of the fixed calendar year for an effluent characteristic or parameter with a measurement frequency of once/year. A calendar year is January through December, or any portion thereof.

24. **"Monthly Average"** means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month. For Fecal Coliform Bacteria (FCB) or *E. coli*, report the Monthly Average as the geometric mean of all "daily discharges" within a calendar month.
25. **"National Pollutant Discharge Elimination System"** means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements under Sections 307, 402, 318, and 405 of the Clean Water Act.
26. "**NOEC**" means No Observed Effect Concentration.
27. **"PMSD"** means Percent Minimum Significant Difference.
28. **"POTW"** means Publicly Owned Treatment Works;
29. **"Reduction of $CBOD_5$/BOD_5 and TSS in mg/l Formula"**
    [(Influent – Effluent) / Influent] × 100
30. **"Severe property damage"** means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in products.
31. **"Sewage sludge"** means the solids, residues, and precipitate separated from or created in sewage by the unit processes at a POTW. Sewage as used in this definition means any wastes, including wastes from humans, households, commercial establishments, industries, and stormwater runoff that are discharged to or otherwise enter a POTW.
32. **"Treatment works"** means any devices and systems used in storage, treatment, recycling, and reclamation of municipal sewage and industrial wastes, of a liquid nature to implement section 201 of the Act, or necessary to recycle reuse water at the most economic cost over the estimated life of the works, including intercepting sewers, sewage collection systems, pumping, power and other equipment, and alterations thereof; elements essential to provide a reliable recycled supply such as standby treatment units and clear well facilities, and any works, including site

acquisition of the land that will be an integral part of the treatment process or is used for ultimate disposal of residues resulting from such treatment.

33. **Units of Measure:**
    "MGD" shall mean million gallons per day.
    "mg/l" shall mean milligrams per liter or parts per million (ppm).
    "µg/l" shall mean micrograms per liter or parts per billion (ppb).
    "cfs" shall mean cubic feet per second.
    "ppm" shall mean parts per million.
    "s.u." shall mean standard units.
34. **"Upset"** means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. Any upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventive maintenance, or careless or improper operations.
35. **"Visible sheen"** means the presence of a film or sheen upon or a discoloration of the surface of the discharge. A sheen can also be from a thin glistening layer of oil on the surface of the discharge.
36. **"Weekday"** means Monday – Friday.

Final Fact Sheet

This Fact Sheet is for information and justification of the permit requirements only. Please note that it is not enforceable. This final permitting decision is for the renewal of discharge Permit Number AR0001392 with Arkansas Division of Environmental Quality (DEQ) Facility Identification Number (AFIN) 58-00002 to discharge to Waters of the State.

1. PERMITTING AUTHORITY

The issuing office is:

Arkansas Division of Environmental Quality
5301 Northshore Drive
North Little Rock, Arkansas 72118-5317

2. APPLICANT

The applicant's mailing address and physical address is:

Entergy Arkansas, LLC - Arkansas Nuclear One
1448 SR 333
Russellville, AR 72802

3. PREPARED BY

The permit was prepared by:

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4. PERMIT ACTIVITY

Previous Permit Effective Date: January 1, 2014
Previous Permit Expiration Date: December 31, 2018

The permittee submitted a permit renewal application on June 26, 2018, with additional information submitted on July 12, 2018 (impingement optimization fact sheet), August 20, 2018 (certification for cooling tower maintenance chemicals), February 20, 2019 (Lead retests at Outfall 008), May 16, 2019 (316b studies per 122.21(r)(10-13)), January 29, 2020 (10-K and 10-Q filings for Entergy Arkansas, LLC), January 30, 2020 (Texas SOS good standing certificate), March 11, 2020 (TRC retests at Outfalls 006, 008, 009), September 2, 2021 (updated process flow diagram), June 8, 2023 (TRC retests at Outfall 013), June 15, 2023 (Arsenic and Copper retests at Outfalls 009 and 010),

and June 23, 2023 (Arsenic retests at Outfall 013). ~~It is proposed that t~~The current discharge permit is being reissued for a 5-year term in accordance with Rules promulgated at 40 C.F.R. § 122.46(a).

DOCUMENT ABBREVIATIONS

In the document that follows, various abbreviations are used. They are as follows:

APC&EC - Arkansas Pollution Control and Ecology Commission
BAT - best available technology economically achievable
BCT - best conventional pollutant control technology
BMP - best management practice
BOD_5 - five-day biochemical oxygen demand
BPJ - best professional judgment
BPT - best practicable control technology currently available
$CBOD_5$ - carbonaceous biochemical oxygen demand
CD - critical dilution
C.F.R. - Code of Federal Rules
cfs - cubic feet per second
COD - chemical oxygen demand
COE - United States Corp of Engineers
CPP - continuing planning process
CWA - Clean Water Act
DMR - discharge monitoring report
DO - dissolved oxygen
ELG - effluent limitation guidelines
EPA - United States Environmental Protection Agency
ESA - Endangered Species Act
FCB - fecal coliform bacteria
gpm - gallons per minute
MGD - million gallons per day
MQL - minimum quantification level
NAICS - North American Industry Classification System
NH_3-N - ammonia nitrogen
$NO_3 + NO_2$-N - nitrate + nitrite nitrogen
NPDES - National Pollutant Discharge Elimination System
O&G - oil and grease
Rule 2 - APC&EC Rule 2
Rule 6 - APC&EC Rule 6
Rule 8 - APC&EC Rule 8
Rule 9 - APC&EC Rule 9
RP - reasonable potential
SIC - standard industrial classification
TDS - total dissolved solids
TMDL - total maximum daily load
TP - total phosphorus
TRC - total residual chlorine

TSS - total suspended solids
UAA - use attainability analysis
USF&WS - United States Fish and Wildlife Service
USGS - United States Geological Survey
WET - whole effluent toxicity
WQMP - water quality management plan
WQS - Water Quality standards
WWTP - wastewater treatment plant

Compliance and Enforcement History:

The compliance and enforcement history for this facility can be reviewed by using the following web link:

https://www.DEQ.state.ar.us/downloads/WebDatabases/PermitsOnline/NPDES/PermitInformation/AR0001392_Draft%20Renewal%20Compliance%20Review_20200108.pdf

5. SIGNIFICANT CHANGES FROM THE PREVIOUSLY ISSUED PERMIT

The permittee is responsible for carefully reading the permit in detail and becoming familiar with all of the changes therein:

1. Part III.C.5 of the permit now requires that DMRs be submitted electronically via NetDMR.
2. Mass limits for TRO at Outfalls 001 and 009, and FAO at Internal Outfall 002, have changed due to updated reported flows from these outfalls. See Section 8.A for updated flows.
3. TSS and O&G concentration limits were added at Outfall 013 to comply with the effluent limitation guidelines for low volume waste sources found in 40 C.F.R. § 423.12(b)(3). See Tables 1 and 2 in Section 11 of this Fact Sheet.
4. O&G concentration limits were added at Internal Outfall 005 to comply with the effluent limitation guidelines for low volume waste sources found in 40 C.F.R. § 423.12(b)(3). See Tables 1 and 2 in Section 11 of this Fact Sheet.
5. FCB limits at Outfall 001 during April were revised to be consistent with Rule 2.507.
6. FCB sampling frequency at Outfall 001 was changed from once/year to once/5 months during May through September, and from once/year to once/7 months during October through April. See Section 14 of this Fact Sheet for explanation.
7. Flow sampling frequency at Outfall 001 was changed from continuous to once/day. See Section 14 of this Fact Sheet for explanation.
8. BOD_5 concentration limits at Internal Outfall 005 were revised to whole numbers based on new decimal place convention used for this parameter.
9. Monitoring and reporting requirements for Arsenic for one year duration at Outfalls 009 and 013 were added.
10. Conditions associated with operation, reporting, and recordkeeping of the cooling water intake structure were added in accordance with Clean Water Act 316(b) requirements (Conditions 16 through 23 of Part II).
11. The facility and outfall coordinates were revised based on a July 26, 2018 site visit using a handheld Garmin gps unit.

12. The daily maximum TSS limit was revised to zero decimal places at Outfalls 003, 004, 006, 008, 010, 011, 012 and 013 based on new decimal place convention used by OWQ.
13. The monthly average and daily maximum O&G limit was revised to zero decimal places at Outfalls 001, 003, 004, 005, 006, 008, 009, 010, 011, 012 and 013 based on new decimal place convention used by OWQ.
14. Outfall 008 was designated as an internal outfall based on updated process flow diagram submitted on September 2, 2021.

6. RECEIVING STREAM SEGMENT AND DISCHARGE LOCATION

The outfalls are located at the following coordinates based on Google Earth using WGS84:

Outfall 001:	Latitude: 35º 18’ 32.5” N	Longitude: 93º 13’ 52.2” W
Internal Outfall 002:	Latitude: 35º 18’ 38.4” N	Longitude: 93º 14’ 02.9” W
Internal Outfall 003:	Latitude: 35º 18’ 35.3” N	Longitude: 93º 13’ 48.6” W
Internal Outfall 004:	Latitude: 35º 18’ 37.0” N	Longitude: 93º 13’ 52.0” W
Internal Outfall 005:	Latitude: 35º 18’ 33.3” N	Longitude: 93º 14’ 13.0” W
Outfall 006:	Latitude: 35º 18’ 27.3” N	Longitude: 93º 13’ 51.2” W
Internal Outfall 008:	Latitude: 35º 18’ 39.4” N	Longitude: 93º 13’ 56.6” W
Outfall 009:	Latitude: 35º 18’ 51.0” N	Longitude: 93º 14’ 12.3” W
Outfall 010:	Latitude: 35º 18’ 40.0” N	Longitude: 93º 13’ 54.7” W
Outfall 011:	Latitude: 35º 18’ 33.9” N	Longitude: 93º 13’ 55.7” W
Outfall 012:	Latitude: 35º 18’ 39.9” N	Longitude: 93º 13’ 49.7” W
Outfall 013:	Latitude: 35º 18’ 42.4” N	Longitude: 93º 14’ 06.9” W

The receiving waters named:

Outfalls 001 and 006: Lake Dardanelle, an impoundment of the Arkansas River in Segment 3H of the Arkansas River Basin. The receiving stream with USGS Hydrologic Unit Code (H.U.C.) of 11110202 and reach # 4060 is a Water of the State classified for primary and secondary contact recreation, raw water source for domestic (public and private), industrial, and agricultural water supplies; propagation of desirable species of fish and other aquatic life; and other compatible uses.

Outfalls 009 through 013: Unnamed tributary of Lake Dardanelle, an impoundment of the Arkansas River in Segment 3H of the Arkansas River Basin. The receiving stream with USGS Hydrologic Unit Code (H.U.C.) of 11110202 and reach # 4060 is a Water of the State classified for secondary contact recreation, raw water source for domestic (public and private), industrial, and agricultural water supplies; propagation of desirable species of fish and other aquatic life; and other compatible uses.

7. 303(d) LIST, TOTAL MAXIMUM DAILY LOADS, ENDANGERED SPECIES, AND ANTI-DEGRADATION CONSIDERATIONS

A. 303(d) List

The receiving streams are not listed on the Arkansas 2018 303(d) list.

B. Applicable Total Maximum Daily Load (TMDL) Reports

There are no applicable TMDLs for the receiving streams.

C. Endangered Species

No comments on the application were received from the U.S. Fish and Wildlife Service (USF&WS). The draft permit and Fact Sheet were sent to the USF&WS for their review and the USF&WS responded that they had no comments.

The USF&WS lists a total of 32 threatened and endangered animals in Arkansas, including 5 fish and 16 shellfish. The fish include the Ozark cavefish, leopard darter, yellowcheek darter, Arkansas River shiner, and pallid sturgeon. None of these fish species are listed by EPA as occurring in the Lake Dardanelle area.

The EPA identifies two endangered species whose habitat range indicates they may be present in the Lake Dardanelle area: the Least Tern and the Arkansas River shiner.

The Least Tern is the smallest member of the gull and term family, and feeds on small fish, crustaceans, and insects that are caught near the water's surface. According to the Audubon Society, the Least Tern is known to use the sand bars of Lake Dardanelle in the area of Lake Dardanelle State Park during migration. No known nest sites exist at this time, although they have in the past and the habitat exists for nesting. The only way the Least Tern could be affected by entrainment at the ANO facility is if the entrainment occurred at levels high enough to affect the availability of their food source. The clupeidae species that account for over 96 percent of entrainment at ANO could potentially be a food source, however, the Least Tern also feeds on other small fish, as well as crustaceans and insects. Together, these factors suggest that the entrainment at the ANO facility is unlikely to affect the overall population of clupeidae species, and that impacts on the Least Tern population are extremely unlikely.

The Arkansas River shiner is a small, streamlined minnow that is generally less than 2.5 inches in length. It feeds on small aquatic insects and invertebrates, and is listed as a federally threatened species. However, this is not a species that is found in Lake Dardanelle. According to the Oklahoma Department of Wildlife Conservation (ODWC), "nearly all of the remaining Arkansas River shiners occur in the Canadian River in Oklahoma, western Texas and eastern New Mexico. A small population may persist in the Pecos River in southwestern Texas where they were accidentally introduced." (ODWC 2018). The Arkansas River shiner is believed to be extirpated from Arkansas, and the last time it was recorded in Arkansas was in 1939 (AGFC 2017). Thus, there is no evidence to suggest that this species could be impacted by the CWIS technology at

the ANO facility.

D. **Anti-Degradation**

The limitations and requirements set forth in this permit for discharge into waters of the State are consistent with the Anti-degradation Policy and all other applicable water quality standards found in APC&EC Rule 2.

8. **OUTFALL, TREATMENT PROCESS DESCRIPTION, AND FACILITY CONSTRUCTION**

The following is a description of the facility described in the application:

A. Average Flow:

Based on highest monthly average flow reported over past two year period of record):

Outfall 001:	1142.7 MGD
Internal Outfall 002:	5.5 MGD
Internal Outfall 003:	0.134 MGD
Internal Outfall 004:	0.024 MGD
Internal Outfall 005:	0.109 MGD
Outfall 006:	0.84 MGD
Outfall 008:	0.284 MGD
Outfall 009:	3.836 MGD
Outfall 010:	0.188 MGD
Outfall 011:	no discharge reported
Outfall 012:	0.053 MGD
Outfall 013:	0.002 MGD

B. Type of Treatment:

Outfall 001:	screening, disinfection
Internal Outfall 002:	screening, disinfection
Internal Outfall 003:	flotation, sedimentation, neutralization (as needed)
Internal Outfall 004:	flocculation, multimedia filtration, sedimentation, carbon adsorption, chemical precipitation, ion exchange, neutralization (as needed)
Internal Outfall 005:	sedimentation, aerated lagoons, sand filtration
Outfall 006:	sedimentation, neutralization (as needed)
Internal Outfall 008:	none
Outfall 009:	sedimentation, dechlorination, neutralization (as needed)
Outfall 010:	none
Outfall 011:	none
Outfall 012:	none
Outfall 013:	none

C. Discharge Description:

Outfall 001: discharge of once through cooling water that flows through Unit 1 condenser and Units 1 and 2 service water systems, and effluent from Internal Outfalls 002, 003, 004, 005, and 008

Internal Outfall 002: cooling tower blowdown from Unit 2 and effluent from Internal Outfalls 005 and 008.

Internal Outfall 003: low volume wastewater as defined in 40 C.F.R. Part 423 consisting of discharge from Unit 1 and 2 turbine building sumps (primary and secondary water systems consisting of, but not limited to, system drains, system leakage, steam generator blowdown, turbine building equipment and floor washdown drains), diesel tank sumps, groundwater, and maintenance wastewaters

Internal Outfall 004: low volume wastewater as defined in 40 C.F.R. Part 423 consisting of discharge from holding tanks associated with low level wastewater treatment system for Unit 1 and 2 primary and secondary water systems, backwash from demineralizer and regeneration water system, and maintenance wastewaters

Internal Outfall 005: treated sanitary wastewater, and low volume wastewater as defined in 40 C.F.R. Part 423 consisting of potable water, blowdown from GSB cooling tower, and effluent from Internal Outfall 008 consisting of maintenance wastewaters, reverse osmosis reject water, and periodic discharge of chemicals from backwash/cleaning the ultra-pure water system

Outfall 006: low volume wastewater as defined in 40 C.F.R. Part 423 consisting of discharge from wastewater holding pond used for collection of wastewater from Unit 1 and 2 turbine building sumps (primary and secondary water systems consisting of, but not limited to, system drains, system leakage, steam generator blowdown, turbine building equipment and floor washdown drains), diesel tank sumps, groundwater, and maintenance wastewaters

Internal Outfall 008: discharge of low volume wastewater as defined in 40 C.F.R. Part 423 consisting of backwash, reject, and maintenance wastewaters from reverse osmosis units associated with the ultra-pure water system

Outfall 009: discharge from emergency cooling pond consisting of lake water, city water, stormwater, and Unit 1 and 2 service water

Outfall 010: low volume wastewater as defined in 40 C.F.R. Part 423 consisting of discharge from temporary maintenance activities associated with draining cooling water systems, operation of temporary cooling water systems, and stormwater

Outfall 011: low volume wastewater as defined in 40 C.F.R. Part 423 consisting of discharge from temporary maintenance activities associated with draining cooling water systems, operation of temporary cooling water systems, and stormwater

Outfall 012: low volume wastewater as defined in 40 C.F.R. Part 423 consisting of discharge from temporary maintenance activities associated with draining cooling water systems, operation of temporary cooling water systems, and stormwater

Outfall 013: low volume wastewater as defined in 40 C.F.R. 423 consisting of discharge from temporary maintenance activities associated with cooling tower screen washing

D. Facility Status: This facility was evaluated using the NPDES Permit Rating Worksheet (MRAT) to determine the correct permitting status. Since the facility's MRAT score of 600 is greater than 80, this facility is classified as a Major Industrial.

E. Facility Construction: This permit does not authorize or approve the construction or modification of any part of the treatment system or facilities. Approval for such construction must be by permit issued under Rule 6.202.

9. **ACTIVITY**

Under the Standard Industrial Classification (SIC) code of 4911 or North American Industry Classification System (NAICS) code of 221113, the applicant's activities are the operation of a nuclear powered electric generating facility.

10. **SEWAGE SLUDGE AND SOLIDS PRACTICES**

The cooling tower is drained occasionally and the accumulation of solids in the tower basin are removed. As needed, sewage sludge (biosolids) that accumulate in the treatment plant sand filters are removed. The solids and biosolids are disposed of in the Ozark Ridge Landfill operated by Waste Management, Inc. located in Yell County under Solid Waste Permit Number 225-S1-R5, or other permitted landfill. Removed solids, and biosolids may also be land applied at permitted sites in accordance with state and federal regulations. Removed sand from the sand beds may be land applied at permitted sites or used for fill at locations approved for beneficial fill using this material. Criteria for use of beneficial fill are contained in APC&EC Rule 22.

11. DEVELOPMENT AND BASIS FOR PERMIT CONDITIONS

The Arkansas Division of Environmental Quality has determined to issue a final permit for the discharge described in the application. Permit requirements are based on federal Rules (40 C.F.R. Parts 122, 124, and Subchapter N), and Rules promulgated pursuant to the Arkansas Water and Air Pollution Control Act (Ark. Code Ann. § 8-4-101 et seq.). All of the information contained in the application, including all of the submitted effluent testing data, was reviewed to determine the need for effluent limits and other permit requirements.

The following is an explanation of the derivation of the conditions of the final permit and the reasons for them or, in the case of notices of intent to deny or terminate, reasons suggesting the decisions as required under 40 C.F.R. § 124.7.

Technology-Based Versus Water Quality-Based Effluent Limitations and Conditions

In accordance with regulations promulgated at 40 C.F.R. § 122.44, the final permit limits are based on either technology-based effluent limits pursuant to 40 C.F.R. § 122.44(a) or on State water quality standards and requirements pursuant to 40 C.F.R. § 122.44(d), whichever are more stringent as follows:

Table 1

Parameter	Water Quality-Based		Technology-Based		Previous Permit		Final Permit	
	Monthly Avg. mg/l	Daily Max. mg/l	Monthly Avg. mg/l	Daily Max. mg/l	Monthly Avg. mg/l	Daily Max. mg/l	Monthly Avg. mg/l	Daily Max. mg/l
Outfall 001 (Final)								
TRO	N/A	N/A	N/A	0.2	N/A	0.2	N/A	0.2
O&G	10	15	N/A	N/A	10.0	15.0	10	15
Temperature	105º F	110º F	N/A	N/A	105º F	110º F	105º F	110º F
FCB (col/100 ml) (October-March)	1000	2000	N/A	N/A	1000	2000	1000	2000
FCB (col/100 ml) (April)	1000	2000	N/A	N/A	200	400	1000	2000
FCB (col/100 ml) (May-September)	200	400	N/A	N/A	200	400	200	400
pH	6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.	
Outfall 002 (Internal)								
FAO	N/A	N/A	0.2	0.5	0.2	0.5	0.2	0.5
Cr, Total Rec.	N/A	N/A	0.2	0.2	0.2	0.2	0.2	0.2
Zn, Total Rec.	N/A	N/A	1.0	1.0	1.0	1.0	1.0	1.0
pH	N/A		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.	

Table 1								
Parameter	Water Quality-Based		Technology-Based		Previous Permit		Final Permit	
	Monthly Avg. mg/l	Daily Max. mg/l	Monthly Avg. mg/l	Daily Max. mg/l	Monthly Avg. mg/l	Daily Max. mg/l	Monthly Avg. mg/l	Daily Max. mg/l
Outfall 003 (Internal)								
TSS	N/A	N/A	30.0	100.0	30.0	100.0	30.0	100.0
O&G	N/A	N/A	15.0	20.0	15.0	20.0	15.0	20.0
pH	N/A		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.	
Outfall 004 (Internal)								
TSS	N/A	N/A	30.0	100.0	30.0	100.0	30.0	100.0
O&G	N/A	N/A	15.0	20.0	15.0	20.0	15.0	20.0
pH	N/A		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.	
Outfall 005 (Internal)								
BOD5	N/A	N/A	30	45	30.0	45.0	30	45
TSS	N/A	N/A	30	45	30.0	45.0	30.0	45.0
O&G	N/A	N/A	15.0	20.0	N/A	N/A	15.0	20.0
pH	N/A		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.	
Outfall 006 (Final)								
TSS	N/A	N/A	30.0	100.0	30.0	100.0	30.0	100.0
O&G	10	15	15.0	20.0	10.0	15.0	10	15
pH	6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.	
Outfall 008 (Internal)								
TSS	N/A	N/A	30.0	100.0	30.0	100.0	30.0	100.0
O&G	10	15	15.0	20.0	10.0	15.0	15.0	20.0
pH	6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.	
Outfall 009 (Final)								
TRO	N/A	N/A	N/A	0.2	N/A	0.2	N/A	0.2
O&G	10	15	15.0	20.0	10.0	15.0	10	15
pH	6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.	
Arsenic	N/A		Report		N/A		Report	
Outfall 010 (Final)								
TSS	N/A	N/A	30.0	100.0	30.0	100.0	30.0	100.0
O&G	10	15	15.0	20.0	10.0	15.0	10	15
pH	6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.	

Table 1								
Parameter	Water Quality-Based		Technology-Based		Previous Permit		Final Permit	
	Monthly Avg. mg/l	Daily Max. mg/l	Monthly Avg. mg/l	Daily Max. mg/l	Monthly Avg. mg/l	Daily Max. mg/l	Monthly Avg. mg/l	Daily Max. mg/l
Outfall 011 (Final)								
TSS	N/A	N/A	30.0	100.0	30.0	100.0	30.0	100.0
O&G	10	15	15.0	20.0	10.0	15.0	10	15
pH	6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.	
Outfall 012 (Final)								
TSS	N/A	N/A	30.0	100.0	30.0	100.0	30.0	100.0
O&G	10	15	15.0	20.0	10.0	15.0	10	15
pH	6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.	
Outfall 013 (Final)								
TSS	N/A	N/A	30.0	100.0	30.0	100.0	30.0	100.0
O&G	10	15	15.0	20.0	10.0	15.0	10	15
pH	6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.		6.0 - 9.0 s.u.	
Arsenic	N/A		Report		N/A		Report	

A. **Justification for Limitations and Conditions of the Final Permit**

Table 2		
Parameter	Water Quality or Technology	Justification
Outfall 001 (Final)		
TRO[1]	Technology	40 C.F.R. §§ 423.13(b)(1) and 423.11(a), and highest monthly average flow reported in past two year period of record
O&G	Water Quality	Rule 2.510, CWA § 402(o), and previous permit
Temperature[2]	Water Quality	Rule 2 Appendix A: "Specific Standards: Arkansas River Valley Ecoregion", CWA § 402(o), and previous permit
FCB	Water Quality	Rule 2.507, CWA § 402(o), and previous permit
pH	Water Quality	Rule 2.504, CWA § 402(o), and previous permit
Outfall 002 (Internal)		
FAO[1]	Technology	40 C.F.R. §§ 423.13(d)(1) and (d)(2) and highest monthly average flow reported in past two year period of record
Chromium[1]	Technology	40 C.F.R. § 423.13(d)(1) and highest monthly average flow reported in past two year period of record
Zinc[1]	Technology	40 C.F.R. § 423.13(d)(1) and highest monthly average flow reported in past two year period of record

Table 2		
Parameter	Water Quality or Technology	Justification
pH	Technology	40 C.F.R. § 423.12(b)(1), 40 C.F.R. § 122.44(l) and previous permit
Outfall 003 (Internal)		
TSS	Technology	40 C.F.R. § 423.12(b)(3), 40 C.F.R. § 122.44(l) and previous permit
O&G	Technology	40 C.F.R. § 423.12(b)(3), 40 C.F.R. § 122.44(l) and previous permit
pH	Technology	40 C.F.R. § 423.12(b)(1), 40 C.F.R. § 122.44(l) and previous permit
Outfall 004 (Internal)		
TSS	Technology	40 C.F.R. § 423.12(b)(3), 40 C.F.R. § 122.44(l) and previous permit
O&G	Technology	40 C.F.R. § 423.12(b)(3), 40 C.F.R. § 122.44(l) and previous permit
pH	Technology	40 C.F.R. § 423.12(b)(1), 40 C.F.R. § 122.44(l) and previous permit
Outfall 005 (Internal)		
BOD5	Technology	40 C.F.R. § 122.44(l) and previous permit
TSS	Technology	40 C.F.R. § 122.44(l) and previous permit
O&G[4]	Technology	40 C.F.R. § 423.12(b)(3)
pH	Technology	40 C.F.R. § 423.12(b)(1), 40 C.F.R. § 122.44(l) and previous permit
Outfall 006 (Final)		
TSS	Technology	40 C.F.R. § 423.12(b)(3), 40 C.F.R. § 122.44(l) and previous permit
O&G	Water Quality	Rule 2.510, CWA § 402(o), and previous permit
pH	Technology	40 C.F.R. § 423.12(b)(1), 40 C.F.R. § 122.44(l) and previous permit
Outfall 008 (Final)		
TSS	Technology	40 C.F.R. § 423.12(b)(3), 40 C.F.R. §122.44(l) and previous permit
O&G	Water Quality	Rule 2.510, CWA § 402(o), and previous permit
pH	Technology	40 C.F.R. § 423.12(b)(1), 40 C.F.R. § 122.44(l) and previous permit
Outfall 009 (Final)		
TRO	Technology	40 C.F.R. § 423.13(b)(1), 40 C.F.R. § 122.44(l) and previous permit
O&G	Water Quality	Rule 2.510, CWA § 402(o), and previous permit
pH	Water Quality	Rule 2.504, CWA § 402(o), and previous permit

Table 2		
Parameter	Water Quality or Technology	Justification
Arsenic (report for 1 year)	Technology	Reporting for one year is required in accordance with the CPP for parameters without state water quality standards.
Outfall 010 (Final)		
TSS	Technology	40 C.F.R. § 423.12(b)(3), 40 C.F.R. § 122.44(l) and previous permit
O&G	Water Quality	Rule 2.510, CWA § 402(o), and previous permit
pH	Technology	40 C.F.R. § 423.12(b)(1), 40 C.F.R. § 122.44(l) and previous permit
Outfall 011 (Final)		
TSS	Technology	40 C.F.R. § 423.12(b)(3), 40 C.F.R. § 122.44(l) and previous permit
O&G	Water Quality	Rule 2.510, CWA § 402(o), and previous permit
pH	Technology	40 C.F.R. § 423.12(b)(1), 40 C.F.R. § 122.44(l) and previous permit
Outfall 012 (Final)		
TSS	Technology	40 C.F.R. § 423.12(b)(3), 40 C.F.R. § 122.44(l) and previous permit
O&G	Water Quality	Rule 2.510, CWA § 402(o), and previous permit
pH	Technology	40 C.F.R. § 423.12(b)(1), 40 C.F.R. § 122.44(l) and previous permit
Outfall 013 (Final)		
TSS[3]	Technology	40 C.F.R. § 423.12(b)(3)
O&G[3]	Water Quality	Rule 2.510
pH	Technology	40 C.F.R. § 423.12(b)(1), 40 C.F.R. § 122.44(l) and previous permit
Arsenic (report for 1 year)	Technology	Reporting for one year is required in accordance with the CPP for parameters without state water quality standards.

[1] Mass limits for FAO at Outfall 001, and TRO, Cr, and Zn at Outfall 002 have been recalculated using the highest monthly average flow reported from these outfalls during the past two year period of record.

[2] The permittee concluded a Use Attainability Analysis (UAA) in 1999 for temperature. Results of the UAA indicated that the current effluent temperature limitations are sufficient to protect the Temperature standard in Rule 2 for Lake Dardanelle (95º F maximum and Δ5º F above natural temperature does not apply, Appendix A of Rule 2, page A-18). Therefore, temperature limits are continued from previous permit.

[3] TSS and O&G limits were added at Outfall 013 in this permit renewal. This discharge is considered "low volume waste sources" as defined in 40 C.F.R. § 423.11(b). Cleaning of the cooling tower screens is considered cooling tower basin cleaning wastes, which are included in the definition. In addition, the definition of low volume waste sources in this effluent limitation guideline includes wastewater from all sources except those for which specific limitations are established in 40 C.F.R. Part 423.

[4] O&G limits were added at Outfall 005 in this permit renewal. This discharge is considered "low volume waste sources" as defined in 40 C.F.R. § 423.11(b). The definition of low volume waste sources in this effluent limitation guideline includes wastewater from all sources except those for which specific limitations are established in 40 C.F.R. Part 423.

B. Anti-backsliding

The final permit is consistent with the requirements to meet Anti-backsliding provisions of the Clean Water Act (CWA), Section 402(o) [40 C.F.R. § 122.44(l)]. The final effluent limitations for reissuance permits must be as stringent as those in the previous permit, unless the less stringent limitations can be justified using exceptions listed in CWA 402(o)(2), CWA 303(d)(4), or 40 C.F.R. § 122.44(l)(2)(i).

The final permit maintains the requirements of the previous permit with the exception of revised limitations for FCB at Outfall 001 during April. This revision is allowed in accordance with CWA §402(o)(2) which provides that relaxed limitations may be allowed where mistaken interpretations of the law were made in previous permit issuance. The previous permit misinterpreted the secondary contact time period stated in Rule 2.507. This is being corrected in this permit.

The mass limits for FAO at Outfall 002 and TRO at Outfall 009 are less stringent than mass limits in previous permit. The new mass limits are based on updated flow rates reported for these outfalls. This revision is allowed in accordance with 40 C.F.R. § 122.44(l) which provides that a relaxed limitation may be allowed where new information is available that was not available at the time of previous permit issuance that would have justified a less stringent effluent limitation. The updated flow rates used in this permit were not available in previous permit issuance, therefore the mass limits at Outfalls 002 and 009 are slightly less stringent than previous permit.

C. Limits Calculations

1. Mass Limits:

   In accordance with 40 C.F.R. § 122.45(f)(1), all pollutants limited in permits shall have limitations expressed in terms of mass if feasible. 40 C.F.R. § 122.45(f)(2) allows for pollutants which are limited in terms of mass to also be limited in terms of other units of measurement.

Outfall 001

Mass limit for Total Residual Oxidants (TRO) is included to comply with the two (2) hour per day per generating unit limit in the effluent limitation guideline. The mass limit is based on the following calculation using the technology based concentrations in 40 C.F.R. §§ 423.13(b)(1) and 423.13(b)(2):

TRO = (0.2 mg/l)(8.34 lb/gal)(1142.7 mgd)(2 hr/day/unit)(1 unit)(day/24hr)
= 158.8 lb/day (daily maximum)

Internal Outfall 002

Mass limits for Free Available Oxidants (FAO) is included to comply with the two (2) hour per day per generating unit limit in the effluent limitation guideline. The mass limit is based on the following calculations using the technology-based concentrations in 40 C.F.R. §§ 423.13(d)(1) and 423.13(d)(2):

FAO = (0.2 mg/l)(8.34 lb/gal)(5.5 mgd)(2 hr/day/unit)(1 unit)(day/24 hr)
= 0.8 lb/day (monthly average)
FAO = (0.5 mg/l)(8.34 lb/gal)(5.5 mgd)(2 hr/day/unit)(1 unit)(day/24 hr)
= 1.9 lb/day (daily maximum)

Outfalls 003, 004, 005, 006, 008, 010, 011, 012, 013

Mass limits are not included due to variable nature of the discharge from these outfalls.

Outfall 009

Mass limit for Total Residual Oxidants (TRO) is included to comply with the two (2) hour per day per generating unit limit in the effluent limitation guideline. The mass limit is based on the following calculation using the technology-based concentration in 40 C.F.R. §§ 423.13(b)(1) and 423.13(b)(2):

TRO = (0.2 mg/l)(8.34 lb/gal)(3.836 mgd)(2 hr/day/unit)(1 unit)(day/24hr)
= 0.5 lb/day (daily maximum)

2. Daily Maximum Limits:

Outfall 001

TRO is based on 40 C.F.R. §§ 423.13(b)(1) and 423.13(b)(2)
O&G is based on Rule 2.510
Temperature is based on the previous permit
pH is based on Rule 2.504

Internal Outfall 002

FAO is based on 40 C.F.R. §§ 423.13(d)(1) and 423.13(d)(2)
Chromium and Zinc are based on 40 C.F.R. § 423.13(d)(1)
pH is based on 40 C.F.R. § 423.12(b)(1)

Internal Outfalls 003 and 004

TSS and O&G are based on 40 C.F.R. § 423.12(b)(3)
pH is based on 40 C.F.R. § 423.12(b)(1)

Internal Outfall 005

BOD_5 is based on the previous permit
TSS is based on the previous permit
O&G is based on 40 C.F.R. § 423.12(b)(3)
pH is based on 40 C.F.R. § 423.12(b)(1)

Outfalls 006 and 008

TSS is based on 40 C.F.R. § 423.12(b)(3)
O&G is based on Rule 2.510
pH is based on 40 C.F.R. § 423.12(b)(1)

Outfall 009

TRO is based on 40 C.F.R. § 423.13(b)(1)
O&G is based on Rule 2.510
pH is based on Rule 2.504

Outfall 010

TSS is based on 40 C.F.R. § 423.12(b)(3)
O&G is based on 40 C.F.R. § 423.12(b)(3)
pH is based on 40 C.F.R. § 423.12(b)(1)

Outfalls 011, 012, and 013

TSS is based on 40 C.F.R. § 423.12(b)(3)
O&G is based on 40 C.F.R. § 423.12(b)(3)
pH is based on 40 C.F.R. § 423.12(b)(1)

D. **Applicable Effluent Limitations Guidelines**

Discharges from facilities of this type are covered by Federal effluent limitations guidelines promulgated under 40 C.F.R. Part 423 – Steam Electric Power Generating Point Source Category. This facility operates a nuclear power plant equipped with two generating units. Unit 1 operates with a once through cooling system, and Unit 2 operates with a closed cycle cooling system. This facility commenced commercial operations in 1974. 40 C.F.R. § 423.13 is applicable to once through cooling water from Unit 1 and cooling water blowdown from Unit 2. 40 C.F.R. § 423.12 is applicable to cooling tower blowdown from Unit 2 and low volume wastewater generated throughout the facility.

The following categorical effluent limitations apply to the regulated wastestreams:

Table 3

Parameter	Rule Citation	Average Monthly Limit, mg/L	Maximum Daily Limit, mg/L
Once Through Cooling Water			
TRO[1,2]	40 C.F.R. § 423.13(b)(1)	N/A	0.2
Cooling Tower Blowdown			
FAO[1,2]	40 C.F.R. § 423.13(d)(1)	0.2	0.5
Total Rec. Chromium[3]	40 C.F.R. § 423.13(d)(1)	0.2	0.2
Total Rec. Zinc[3]	40 C.F.R. § 423.13(d)(1)	1.0	1.0
The 126 priority pollutants contained in chemicals added for cooling tower maintenance, except for Total Rec. Chromium and Total Rec. Zinc[3]	40 C.F.R. § 423.13(d)(1)	No detectable amount	No detectable amount
pH	40 C.F.R. § 423.12(b)(1)	6.0 – 9.0 s.u.	
Low Volume Wastewater			
TSS	40 C.F.R. § 423.12(b)(3)	30.0	100.0
O&G	40 C.F.R. § 423.12(b)(3)	15.0	20.0
pH	40 C.F.R. § 423.12(b)(1)	6.0 – 9.0 s.u.	

[1] The facility uses bromides instead of chlorine, therefore for compliance purposes the terms total residual oxidants (TRO) and free available oxidants (FAO) are used throughout the permit pursuant to 40 C.F.R. § 423.11(a).
[2] 40 C.F.R. §§ 423.13(b)(2) and (d)(2) limits the discharge of TRO and FAO, respectively, from any generating unit to two hours per day.
[3] Monitoring for these parameters is waived based upon the certification dated August 15, 2018.

40 C.F.R. § 423.12(b)(1) requires the pH of all discharges, except for once through cooling water, to be within the range of 6.0 – 9.0 s.u.

40 C.F.R. § 423.12(b)(2) states there shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

E. **Priority Pollutant Scan (PPS)**

DEQ has reviewed and evaluated the effluent in accordance with the potential toxicity of each analyzed pollutant using the procedures outlined in the Continuing Planning Process (CPP).

The concentration of each pollutant after mixing with the receiving stream was compared to the applicable water quality standards as established in the Arkansas Water Quality Standards (AWQS), Rule 2 (Rule 2.508) and criteria obtained from the "Quality Criteria for Water, 1986 (Gold Book)."

Under Federal Rule 40 C.F.R. § 122.44(d), as adopted by Rule 6, if a discharge poses the reasonable potential to cause or contribute to an exceedance above a water quality standard, the permit must contain an effluent limitation for that pollutant. Effluent limitations for the toxicants listed below have been derived in a manner consistent with the Technical Support Document (TSD) for Water Quality-based Toxics Control (EPA, March 1991), the CPP, and 40 C.F.R. § 122.45(c).

The following items were used in calculations:

Outfall 001 (discharge to Lake Dardanelle)

Table 4		
Parameter	Value	Source
Discharge Flow = Q	Outfall 001 1142.7 MGD	Highest monthly average flow reported December 2017 thru November 2019
Diameter of discharge pipe	D = 8.0 ft	Permittee
Distance from discharge pipe**	X = 725 ft (acute aquatic) = 725 ft (chronic aquatic) = 725 ft (human health)	Jet-Mix Model*
TSS	12.0 mg/l	CPP, Attachment V
Hardness as $CaCO_3$	25.0 mg/l	CPP, Attachment VI
pH	7.49 s.u.	ARK0033

*Jet-Mix Model was used since discharge is into a lake.
**Distance of the man-made effluent channel was used for mixing zone boundary in the jet-mix model.

Outfall 006 (discharge to Lake Dardenelle)

Table 5		
Parameter	Value	Source
Discharge Flow = Q	0.84 MGD (Reported in November 2019)	Highest monthly average flow reported December 2017 thru November 2019
Diameter of discharge pipe	D = 0.5 ft	Permittee
Distance from discharge pipe	X = 25 ft (acute aquatic) = 100 ft (chronic aquatic) = 200 ft (human health)	CPP Jet-Mix Model*
TSS	12.0 mg/l	CPP, Attachment V
Hardness as $CaCO_3$	25.0 mg/l	CPP, Attachment VI
pH	7.49 s.u.	ARK0033

*Jet-Mix Model was used since discharge is into a lake.

Outfalls 009, 010[1], 013 (discharge to unnamed tributaries of Lake Dardanelle)

Table 6		
Parameter	Value	Source
Discharge Flow = Q	Outfall 009: 3.836 MGD Outfall 010: 0.188 MGD Outfall 013: 0.002 MGD	Highest monthly average flow reported December 2017 thru November 2019
7Q10 Background Flow	0 cfs	U.S.G.S.
LTA Background Flow	0 cfs	EPA Technical Support Document (3 × 7Q10)
TSS	12.0 mg/l	CPP, Attachment V
Hardness as $CaCO_3$	125.0 mg/l	CPP, Attachment VI
pH	7.49 s.u.	ARK0033

[1] Outfalls 010, 011, and 012 discharge the same type of wastewater, therefore a PPS was only performed on 010, which is representative of the effluent characteristics of 011 and 012.

The following pollutants were reported above detection levels:

Table 7		
Pollutant	Concentration Reported, µg/l	MQL, µg/l
Outfall 001		
Total Recoverable Arsenic	1.0	0.5
Total Recoverable Copper	1.7	0.5
Total Recoverable Nickel	2.2	0.5
Total Recoverable Phenols	7.2	5
Outfall 006		
Total Recoverable Arsenic	1.7	0.5
Total Recoverable Cadmium	1.1	0.5
Total Recoverable Copper	30.0	0.5
Total Recoverable Lead	1.3	0.5
Total Recoverable Nickel	2.0	0.5
Total Recoverable Phenols	100	5
Total Recoverable Zinc	48	20
Outfall 009		
Total Recoverable Arsenic	2.2, 9, 12, 19	0.5
Total Recoverable Copper	1.7	0.5
Total Recoverable Nickel	1.7	0.5
Outfall 010		
Total Recoverable Copper	5.1, 3.2, 7.1, 2.1, 2.6, 2.3	0.5
Total Recoverable Lead	1.9, <0.5, <0.5, 0.52	0.5
Total Recoverable Nickel	5.3	0.5
Total Recoverable Zinc	21.0	20
Outfall 013		
Total Recoverable Arsenic	2.0, 1.9, 2.5, 4.2	0.5
Total Recoverable Copper	2.8, 2.3, 2.1, 3.0, 2.7, 2.9, 1.3	0.5
Total Recoverable Lead	0.25, 0.25, 0.25, 0.65, 0.61, 0.65, 0.57	0.5
Total Recoverable Nickel	1.5, 1.4, 1.4, 1.5, 1.4, 1.4, 1.5	0.5
Total Recoverable Zinc	39, 27, 29, 39, 27, 29, ND	20

Instream Waste Concentrations (IWCs) were calculated in the manner described in Appendix D of the CPP and compared to the applicable Criteria. Tables 8-22 summarize the results of the analysis. The complete evaluations can be viewed on the Division's website at the following hyperlinks:

Outfall 001
http://www.adeq.state.ar.us/downloads/WebDatabases/PermitsOnline/NPDES/PermitInformation/AR0001392_PPS%20evaluation%20outfall%20001_20200813.pdf

Outfall 006
http://www.adeq.state.ar.us/downloads/WebDatabases/PermitsOnline/NPDES/PermitInformation/AR0001392_PPS%20evaluation%20outfall%20006_20200813.pdf

Outfall 009
http://www.adeq.state.ar.us/downloads/WebDatabases/PermitsOnline/NPDES/PermitInformation/AR0001392_PPS%20evaluation%20outfall%20009_20200813.pdf

Outfall 010
http://www.adeq.state.ar.us/downloads/WebDatabases/PermitsOnline/NPDES/PermitInformation/AR0001392_PPS%20evaluation%20outfall%20010_20200813.pdf

Outfall 013
http://www.adeq.state.ar.us/downloads/WebDatabases/PermitsOnline/NPDES/PermitInformation/AR0001392_PPS%20evaluation%20outfall%20013_20200813.pdf

1. **Aquatic Toxicity Evaluation**

a. Acute Criteria Evaluation

Table 8					
Acute Criteria Evaluation Outfall 001					
Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC)	Criteria[2]	Reasonable Potential (Yes/No)
			Acute, µg/l	Acute, µg/l	
Total Recoverable Arsenic	1.0	2.13	0.12	None	No
Total Recoverable Copper	1.7	3.62	0.20	87.79	No
Total Recoverable Nickel	2.2	4.69	0.26	6627.26	No
Total Recoverable Phenols	7.2	15.34	0.84	None	No
Total Residual Oxidants[3]	The technology-based effluent limit is more stringent than the acute water quality based effluent limit, therefore the TBEL is continued from previous permit. See the evaluation[4] below.				

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset.
[2] Criteria are from Rule 2.508 unless otherwise specified.
[3] Total Residual Chlorine (TRC) is expressed as Total Residual Oxidants (TRO) in this permit since facility uses bromides.

[4] **TRO Acute Evaluation (Outfall 001)**

EPA considers concentrations TRC at the edge of the mixing zone higher than 0.011 mg/l (Chronic Criteria) or higher than 0.019 mg/l (Acute Criteria) to be toxic to aquatic organisms. The receiving water for Outfall 001 is to an effluent canal which connects to a lake, therefore a jet-mix model was used to calculate the instream waste concentration (IWC) after mixing at the end of the effluent canal. Since this outfall is subject to technology-based limit (TBEL) of 0.2 mg/l for TRC (expressed as Total Residual Oxidants (TRO) in this permit since facility uses bromides), the TBEL must be compared to the Water Quality Based Limit (WQBEL) and the most stringent limit must be included in the permit. The calculation of the WQBEL is shown as follows:

$$\% \text{ effluent at distance } X = [(2.8)(D)(\pi)^{0.5} \times 100] / X \qquad \text{(Jet-Mix Equation)}$$

Where,
X = distance for mixing zone
D = effluent pipe diameter in feet = 8 feet
$\pi = 3.14159$

Mixing Zone Calculations

The distance of the effluent canal is approximately 725 feet. This distance (X) was used for mixing zone for acute criterion.

% effluent = $[(2.8)(8)(3.14159)^{0.5} \times 100] / 725$
% effluent = 5.48%
Dilution factor = 0.0548

The EPA acute criterion divided by the dilution factor calculated using the jet-mix equation gives the allowed effluent concentration (WQBEL):

WQBEL = Acute Criterion / (DF)
WQBEL = (0.019 mg/l) / (0.0548) = 0.347 mg/l

Since the TBEL is more stringent than acute WQBEL, the TBEL limit of 0.2 mg/l for TRO is continued.

Table 9
Acute Criteria Evaluation Outfall 006

Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC)	Criteria[2]	Reasonable Potential (Yes/No)
			Acute, µg/l	Acute, µg/l	
Total Recoverable Arsenic	1.7	3.62	0.36	None	No
Total Recoverable Cadmium	1.1	2.34	0.23	22.84	No
Total Recoverable Copper	30.0	63.9	6.34	87.79	No
Total Recoverable Lead	1.3	2.8	0.27	363.54	No
Total Recoverable Nickel	2.0	4.3	0.42	6627.26	No
Total Recoverable Phenols	100	213	21.14	None	No
Total Recoverable Zinc	48	102.2	10.15	794.63	No

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset.
[2] Criteria are from Rule 2.508 unless otherwise specified.

Table 10					
Acute Criteria Evaluation Outfall 009					
Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC)	Criteria[2]	Reasonable Potential (Yes/No)
			Acute, µg/l	Acute, µg/l	
Total Residual Arsenic	2.2, 9, 12, 19	17.46	17.46	None	No
Total Residual Copper	1.7	3.62	3.62	10.99	No
Total Residual Nickel	1.7	3.62	3.62	782.33	No

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset.
[2] Criteria are from Rule 2.508 unless otherwise specified.

Table 11					
Acute Criteria Evaluation Outfall 010					
Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC)	Criteria[2]	Reasonable Potential (Yes/No)
			Acute, µg/l	Acute, µg/l	
Total Recoverable Copper	5.1, 3.2, 7.1, 2.1, 2.6, 2.3	7.18	7.18	10.99	No
Total Recoverable Lead	<0.5, <0.5, 0.52	0.68	0.68	62.30	No
Total Recoverable Nickel	5.3	11.29	11.29	782.33	No
Total Recoverable Zinc	21.0	44.73	44.73	96.81	No

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset.
[2] Criteria are from Rule 2.508 unless otherwise specified.

Table 12					
Acute Criteria Evaluation Outfall 013					
Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC)	Criteria[2]	Reasonable Potential (Yes/No)
			Acute, µg/l	Acute, µg/l	
Total Recoverable Arsenic	2.0, 1.9, 2.5, 4.2	5.35	5.35	None	No
Total Recoverable Copper	2.8, 2.3, 2.1, 3.0, 2.7, 2.9, 1.3	5.03	5.03	10.99	No
Total Recoverable Lead	0.25, 0.25, 0.25, 0.65, 0.61, 0.65, 0.57	0.89	0.89	62.30	No
Total Recoverable Nickel	1.5, 1.4, 1.4, 1.5, 1.4, 1.4, 1.5	3.07	3.07	782.33	No
Total Recoverable Zinc	39, 27, 29, 39, 27, 29, ND	56.57	56.57	96.81	No

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset.
[2] Criteria are from Rule 2.508 unless otherwise specified.

b. Chronic Criteria Evaluation

Table 13					
Chronic Criteria Evaluation Outfall 001					
Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC)	Criteria[2]	Reasonable Potential (Yes/No)
			Chronic, µg/l	Chronic, µg/l	
Total Recoverable Arsenic	1.0	2.13	0.12	None	No
Total Recoverable Copper	1.7	3.62	0.20	57.43	No
Total Recoverable Nickel	2.2	4.69	0.26	736.01	No
Total Recoverable Phenols	7.2	15.34	0.84	None	No
Total Residual Oxidants[3]	The technology-based effluent limit is more stringent than the acute water quality based effluent limit, therefore the TBEL is continued from previous permit. See the evaluation[4] below.				

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset.
[2] Criteria are from Rule 2.508 unless otherwise specified.
[3] Total Residual Chlorine (TRC) is expressed as Total Residual Oxidants (TRO) in this permit since facility uses bromides.

[4] **TRO Chronic Evaluation (Outfall 001)**

EPA considers concentrations at the edge of the mixing zone higher than 0.011 mg/l (Chronic Criteria) to be toxic to aquatic organisms. The receiving water for Outfall 001 is to an effluent canal which connects to a lake, therefore a jet-mix model was used to calculate the instream waste concentration (IWC) after mixing at the end of the effluent canal. Since this outfall is subject to technology-based limit (TBEL) of 0.2 mg/l for TRC (expressed as Total Residual Oxidants (TRO) in this permit since facility uses bromides), the TBEL must be compared to the Water Quality Based Limit (WQBEL) and the most stringent limit must be included in the permit. The calculation of the WQBEL is shown as follows:

$$\% \text{ effluent at distance } X = [(2.8)(D)(\pi)^{0.5} \times 100] / X \qquad \text{(Jet-Mix Equation)}$$

Where,
X = distance for mixing zone
D = effluent pipe diameter in feet = 8 feet
$\pi = 3.14159$

Mixing Zone Calculations

The distance of the effluent canal is approximately 725 feet. This distance was used for mixing zone for acute criterion.

% effluent = $[(2.8)(8)(3.14159)^{0.5} \times 100] / 725$
% effluent = 5.48%
Dilution factor = 0.0548

The EPA acute criterion divided by the dilution factor calculated using the jet-mix equation gives the allowed effluent concentration (WQBEL):

WQBEL = Chronic Criterion / (DF)
WQBEL = (0.011 mg/l) / (0.0548) = 0.2 mg/l

Since the TBEL is equal to chronic WQBEL, the TBEL limit of 0.2 mg/l for TRO is continued.

Table 14
Chronic Criteria Evaluation Outfall 006

Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC)	Criteria[2]	Reasonable Potential (Yes/No)
			Chronic, µg/l	Chronic, µg/l	
Total Recoverable Arsenic	1.7	3.62	0.09	None	No
Total Recoverable Cadmium	1.1	2.34	0.06	5.89	No
Total Recoverable Copper	30.0	63.9	1.59	57.43	No
Total Recoverable Lead	1.3	2.8	0.07	14.17	No
Total Recoverable Nickel	2.0	4.3	0.11	736.01	No
Total Recoverable Phenols	100	213	5.29	None	No
Total Recoverable Zinc	48	102.2	2.54	725.62	No

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset.
[2] Criteria are from Rule 2.508 unless otherwise specified.

Table 15					
Chronic Criteria Evaluation Outfall 009					
Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC)	Criteria[2]	Reasonable Potential (Yes/No)
			Chronic, µg/l	Chronic, µg/l	
Total Residual Arsenic	2.2, 9, 12, 19	17.46	17.46	None	No
Total Residual Copper	1.7	3.62	3.62	8.28	No
Total Residual Nickel	1.7	3.62	3.62	86.88	No

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset.
[2] Criteria are from Rule 2.508 unless otherwise specified.

Table 16					
Chronic Criteria Evaluation Outfall 010					
Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC)	Criteria[2]	Reasonable Potential (Yes/No)
			Chronic, µg/l	Chronic, µg/l	
Total Recoverable Copper	5.1, 3.2, 7.1, 2.1, 2.6, 2.3	7.18	7.18	8.28	No
Total Recoverable Lead	<0.5, <0.5, 0.52	0.68	0.68	2.43	No
Total Recoverable Nickel	5.3	11.29	11.29	86.88	No
Total Recoverable Zinc	21.0	44.73	44.73	88.40	No

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset.
[2] Criteria are from Rule 2.508 unless otherwise specified.

Table 17					
Chronic Criteria Evaluation Outfall 013					
Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC)	Criteria[2]	Reasonable Potential (Yes/No)
			Chronic, µg/l	Chronic, µg/l	
Total Recoverable Arsenic	2.0, 1.9, 2.5, 4.2	5.35	5.35	None	No
Total Recoverable Copper	2.8, 2.3, 2.1, 3.0, 2.7, 2.9, 1.3	5.03	5.03	8.28	No
Total Recoverable Lead	0.25, 0.25, 0.25, 0.65, 0.61, 0.65, 0.57	0.89	0.89	2.43	No
Total Recoverable Nickel	1.5, 1.4, 1.4, 1.5, 1.4, 1.4, 1.5	3.07	3.07	86.88	No
Total Recoverable Zinc	39, 27, 29, 39, 27, 29, ND	56.57	56.57	88.40	No

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset.
[2] Criteria are from Rule 2.508 unless otherwise specified.

2. Human Health (Bioaccumulation) Evaluation

Table 18					
Human Health Evaluation Outfall 001					
Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC) Human Health µg/l	Criteria[2] Human Health µg/l	Reasonable Potential (Yes/No)
Total Recoverable Arsenic	1.0	2.13	0.12	1.4[3]	No
Total Recoverable Copper	1.7	3.62	0.20	13,000[3]	No
Total Recoverable Nickel	2.2	4.69	0.26	46,000[3]	No
Total Recoverable Phenols	7.2	15.34	0.84	None	No
Total Residual Oxidants[4]	200[5]	200	10.96	4,000[6]	No

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset, except for Total Residual Oxidants where no factor was used because the technology-based limit for TRO was evaluated as opposed to a reported concentration.

[2] Criteria are from Rule 2.508 unless otherwise specified.

[3] Adapted from "National Recommended Water Quality Criteria – Human Health Criteria Table", EPA. The respective WQC from the noted reference are Consumption of Organism Only values (if available). The values from the noted reference are for a lifetime risk factor of 10^{-6}. These values have been multiplied by 10 to correspond to human health criteria lifetime risk factor of 10^{-5} as stated in Rule 2.508.

[4] Total Residual Chlorine (TRC) is expressed as Total Residual Oxidants (TRO) in this permit since facility uses bromides.

[5] Current technology-based limit for TRO.

[6] Primary Drinking Water Maximum Residual Disinfectant Contaminant Level (MRDL).

Table 19					
Human Health Evaluation Outfall 006					
Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC) Human Health µg/l	Criteria[2] Human Health µg/l	Reasonable Potential (Yes/No)
Total Recoverable Arsenic	1.7	3.62	0.04	1.4[3]	No
Total Recoverable Cadmium	1.1	2.34	0.03	5.0[4]	No
Total Recoverable Copper	30.0	63.9	0.79	13,000[3]	No
Total Recoverable Lead	1.3	2.8	0.03	50[6]	No
Total Recoverable Nickel	2.0	4.3	0.05	46,000[3]	No
Total Recoverable Phenols	100	213	2.64	None	No
Total Recoverable Zinc	48	102.2	1.27	260,000[3]	No
Total Residual Chlorine	260	260	3.23	4,000[5]	No

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset, except for TRC where no factor was used.
[2] Criteria are from Rule 2.508 unless otherwise specified.
[3] Adapted from "National Recommended Water Quality Criteria – Human Health Criteria Table", EPA. The respective WQC from the noted reference are Consumption of Organism Only values (if available). The values from the noted reference are for a lifetime risk factor of 10^{-6}. These values have been multiplied by 10 to correspond to human health criteria lifetime risk factor of 10^{-5} as stated in Rule 2.508.
[4] Primary Drinking Water Maximum Contaminant Level (MCL).
[5] Primary Drinking Water Maximum Residual Disinfectant Contaminant Level (MRDL).
[6] EPA Gold Book, 1986.

Table 20					
Human Health Evaluation Outfall 009					
Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC) Human Health µg/l	Criteria[2] Human Health µg/l	Reasonable Potential (Yes/No)
Total Residual Arsenic	2.2, 9, 12, 19	17.46	17.46	1.4[3]	Yes
Total Residual Copper	1.7	3.62	3.62	13,000[3]	No
Total Residual Nickel	1.7	3.62	3.62	46,000[3]	No
Total Residual Chlorine	300	300	300	4,000[4]	No

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset, except for TRC where no factor was used.

[2] Criteria are from Rule 2.508 unless otherwise specified.

[3] Adapted from "National Recommended Water Quality Criteria – Human Health Criteria Table", EPA. The respective WQC from the noted reference are Consumption of Organism Only values (if available). The values from the noted reference are for a lifetime risk factor of 10^{-6}. These values have been multiplied by 10 to correspond to human health criteria lifetime risk factor of 10^{-5} as stated in Rule 2.508.

[4] Primary Drinking Water Maximum Residual Disinfectant Contaminant Level (MRDL).

Table 21					
Human Health Evaluation Outfall 010					
Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC) Human Health µg/l	Criteria[2] Human Health µg/l	Reasonable Potential (Yes/No)
Total Recoverable Copper	5.1, 3.2, 7.1, 2.1, 2.6, 2.3	7.17	7.17	13,000[3]	No
Total Recoverable Lead	1.9, <0.5, <0.5, 0.52	1.06	1.06	50[4]	No
Total Recoverable Nickel	37.0, 5.1, 3.2, 7.1	17.24	17.24	46,000[3]	No
Total Recoverable Zinc	21.0	44.73	44.73	260,000[3]	No
Total Residual Chlorine	240	240	240	4,000[5]	No

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset, except for TRC where no factor was used.
[2] Criteria are from Rule 2.508 unless otherwise specified.
[3] Adapted from "National Recommended Water Quality Criteria – Human Health Criteria Table", EPA. The respective WQC from the noted reference are Consumption of Organism Only values (if available). The values from the noted reference are for a lifetime risk factor of 10^{-6}. These values have been multiplied by 10 to correspond to human health criteria lifetime risk factor of 10^{-5} as stated in Rule 2.508.
[4] EPA Gold Book, 1986.
[5] Primary Drinking Water Maximum Residual Disinfectant Contaminant Level (MRDL).

Table 22					
Human Health Evaluation Outfall 013					
Pollutant	Concentration Reported (C_e) µg/l	$C_e \times 2.13$[1]	Instream Waste Concentration (IWC) Human Health µg/l	Criteria[2] Human Health µg/l	Reasonable Potential (Yes/No)
Total Recoverable Arsenic	2.0, 1.9, 2.5, 4.2	5.35	5.35	1.4[3]	Yes
Total Recoverable Copper	2.8, 2.3, 2.1, 3.0, 2.7, 2.9, 1.3	5.03	5.03	13,000[3]	No
Total Recoverable Lead	0.25, 0.25, 0.25, 0.65, 0.61, 0.65, 0.57	0.89	0.89	50[4]	No
Total Recoverable Nickel	1.5, 1.4, 1.4, 1.5, 1.4, 1.4, 1.5	3.07	3.07	46,000[3]	No
Total Recoverable Zinc	39, 27, 29, 39, 27, 29, ND	56.57	56.57	260,000[3]	No

[1] Statistical ratio used to estimate the 95th percentile using a single effluent concentration or the geometric mean of a dataset.

[2] Criteria are from Rule 2.508 unless otherwise specified.

[3] Adapted from "National Recommended Water Quality Criteria – Human Health Criteria Table", EPA. The respective WQC from the noted reference are Consumption of Organism Only values (if available). The values from the noted reference are for a lifetime risk factor of 10^{-6}. These values have been multiplied by 10 to correspond to human health criteria lifetime risk factor of 10^{-5} as stated in Rule 2.508.

[4] EPA Gold Book, 1986.

Arsenic (Outfalls 009 and 013)

The CPP requires that for all pollutants for which there are no applicable state water quality standards, IWCs are to be compared with the EPA Human Health Criteria (fish consumption only). If dilution calculations show that the in-stream concentration exceeds these criteria, the permit will require the permittee to monitor and report for the pollutant of concern once per quarter for one year only. A reopener clause has been included in the permit (see Part II.3) to provide permit limits if state water quality standards are developed for the applicable pollutants, and the data shows that there is a reasonable potential for the discharge to violate those water quality standards.

As can be seen in the Human Health Evaluation tables above, the calculated IWCs for Arsenic at Outfalls 009 and 013 are higher than the EPA Human Health Criterion. A.C.A. § 8-4-216 authorizes the Division to require the submission of any information relevant to meeting the requirements of the Arkansas Water and Air Pollution Control Act. A requirement to monitor and report for Arsenic at Outfalls 009 and 013 once per quarter for one year has been added to the permit so that, in the event that a WQS for Arsenic is added to Rule 2.508, data will be available to perform a reasonable potential analysis. This is in accordance with the procedure in Appendix D of the CPP (Appendix D, Part IV – Chemical Specific Standards and Criteria, Section E – Protection of Human Health Criteria of the Discharge Permit, Toxic Control Implementation Procedure).

12. WHOLE EFFLUENT TOXICITY

Section 101(a)(3) of the Clean Water Act states that "…it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited." In addition, DEQ is required under 40 C.F.R. § 122.44(d)(1), adopted by reference in Rule 6, to include conditions as necessary to achieve water quality standards as established under Section 303 of the Clean Water Act. Arkansas has established a narrative criteria which states "toxic materials shall not be present in receiving waters in such quantities as to be toxic to human, animal, plant or aquatic life or to interfere with the normal propagation, growth and survival of aquatic biota."

Whole effluent toxicity (WET) testing is the most direct measure of potential toxicity which incorporates the effects of synergism of effluent components and receiving stream water quality characteristics. It is the national policy of EPA to use bioassays as a measure of toxicity to allow evaluation of the effects of a discharge upon a receiving water (49 Federal Register 9016-9019, March 9, 1984). EPA Region 6 and the State of Arkansas are now implementing the Post Third Round Policy and Strategy established on September 9, 1992, and EPA Region 6 Post-Third Round Whole Effluent Toxicity Testing Frequencies, revised March 13, 2000. Whole effluent toxicity testing of the effluent is thereby required as a condition of this permit to assess potential toxicity. The whole effluent toxicity testing procedures stipulated as a condition of this permit are as follows:

TOXICITY TESTS	FREQUENCY
Chronic WET	once/quarter

Requirements for measurement frequency are based on the CPP.

Since discharge of Outfall 001 is directly to a lake, the 7Q10 is less than 100 cfs (ft^3/sec). Therefore, chronic WET testing requirements will be included in the permit.

The calculations for dilution used for chronic WET testing are as follows:

Critical dilution (CD) = (Qd/(Qd + Qb)) × 100

Qd = Average flow = 1143 MGD = 1771 cfs
7Q10 = 0 cfs
Qb = Background flow = (0.67) × 7Q10 = 0 cfs
CD = (1771) / (1771 + 0) × 100 = 100%

Toxicity tests shall be performed in accordance with protocols described in "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms", EPA/600/4-91/002, July 1994. A minimum of five effluent dilutions in addition to an appropriate control (0%) are to be used in the toxicity tests. These additional effluent concentrations are **32%, 42%, 56%, 75%, and 100%** (See the CPP). The low-flow effluent concentration (critical dilution) is defined as **100%** effluent. The requirement for chronic WET tests is based on the magnitude of the facility's discharge with respect to receiving stream flow. The stipulated test species, *Ceriodaphnia dubia* and the Fathead minnow (*Pimephales promelas*) are representative of organisms indigenous to the geographic area of the facility; the use of these is consistent with the requirements of the State water quality standards. The WET testing frequency has been established to provide data representative of the toxic potential of the facility's discharge, in accordance with the Rules promulgated at 40 C.F.R. § 122.48.

Results of all dilutions as well as the associated chemical monitoring of pH, temperature, hardness, dissolved oxygen conductivity, and alkalinity shall be reported according to EPA-821-R-02-013, October 2002 and shall be submitted as an attachment to the Discharge Monitoring Report (DMR).

This permit may be reopened to require further WET testing studies, Toxicity Reduction Evaluation (TRE) and/or effluent limits if WET testing data submitted to the Division shows toxicity in the permittee's discharge. Modification or revocation of this permit is subject to the provisions of 40 C.F.R. § 122.62, as adopted by reference in APC&EC Rule 6. Increased or intensified toxicity testing may also be required in accordance with Section 308 of the Clean Water Act and Section 8-4-201 of the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended).

Administrative Records

The following information summarizes toxicity tests submitted by the permittee during the term of the current permit at Outfall **001**:

Permit Number:	AR0001392	AFIN:	58-00002	Outfall Number:	001
Date of Review:	1/17/2020	Reviewer:	M. Barnett		
Facility Name:	Entergy Operations, Inc. – Arkansas Nuclear One				
Previous Dilution series:	32, 42, 56, 75, 100	Proposed Dilution Series:	32, 42, 56, 75, 100		
Previous Critical Dilution:	100	Proposed Critical Dilution:	100		
Previous TRE activities:	None				

Frequency recommendation by species

Pimephales promelas (Fathead minnow):	once per quarter
Ceriodaphnia dubia (water flea):	once per quarter

TEST DATA SUMMARY

	Vertebrate (*Pimephales promelas*)		Invertebrate (*Ceriodaphnia dubia*)	
TEST DATE	Lethal	Sub-Lethal	Lethal	Sub-Lethal
	NOEC	NOEC	NOEC	NOEC
12/31/2014	100	100	100	100
3/31/2015	100	100	100	100
6/30/2015	100	100	100	100
9/30/2015	100	100	100	100
12/31/2015	100	100	100	100
3/31/2016	100	100	100	100
6/30/2016	100	100	100	100
9/30/2016	100	100	100	100
12/31/2016	100	100	100	100
3/31/2017	100	100	100	100
6/30/2017	100	100	100	100
9/30/2017	100	100	100	100
12/31/2017	100	100	100	100
6/30/2018	100	100	100	100
9/30/2018	100	100	100	100
12/31/2018	100	100	100	100
6/30/2019	100	100	100	100
9/30/2019	100	100	100	100

REASONABLE POTENTIAL CALCULATIONS

	Vertebrate Lethal	Vertebrate Sub-lethal	Invertebrate Lethal	Invertebrate Sub-Lethal
Min NOEC Observed	100	100	100	100
TU at Min Observed	1.00	1.00	1.00	1.00
Count	18	18	18	18
Failure Count	0	0	0	0
Mean	1.000	1.000	1.000	1.000
Std. Dev.	0.000	0.000	0.000	0.000
CV	0	0	0	0
RPMF	0	0	0	0
Reasonable Potential	0.000	0.000	0.000	0.000
100/Critical dilution	1.000	1.000	1.000	1.000
Does Reasonable Potential Exist	No	No	No	No

PERMIT ACTION

P. promelas Chronic - monitoring
C. dubia Chronic - monitoring

13. STORMWATER REQUIREMENTS

All stormwater at this facility is discharged through one of the permitted outfalls in this permit. Therefore, separate stormwater general permit coverage is not required. Stormwater runoff commingling with other process wastewater discharged from Outfalls 001, 006, 009, 010, 011, 012, and 013 shall be managed in accordance with Best Management Practices (BMPs) in the form of a stormwater pollution prevention plan (SWPPP).

14. SAMPLE TYPE AND FREQUENCY

Rules require permits to establish monitoring requirements to yield data representative of the monitored activity [40 C.F.R. § 122.48(b)] and to ensure compliance with permit limitations [40 C.F.R. § 122.44(i)(l)].

Requirements for sample type and sampling frequency have been based on the current discharge permit for all outfalls with the following exceptions:

Flow frequency at Outfall 001 was changed from continuous to once/day because it is a calculated value and not a continuous flow meter. Also, the FCB sampling frequency at Outfall 001 was clarified for the primary and secondary contact seasons.

Arsenic sampling frequency at Outfalls 009 and 013 was based on the CPP.

TSS and O&G sample frequency at Outfall 013 was based on sample frequency of pH at this outfall and is considered the best professional judgment of the permitting agency.

Table 23

Parameter	Previous Permit		Final Permit	
	Frequency of Sample	Sample Type	Frequency of Sample	Sample Type
Outfall 001				
Flow	Continuous	Calculated	Once/day	Calculated
TRO	Once/week	Grab	Once/week	Grab
O&G	Once/month	Grab	Once/month	Grab
FCB (May-Sep)	Once/year	Grab	Once/5 months	Grab
FCB (Oct-Apr)	Once/year	Grab	Once/7 months	Grab
Temperature	Continuous	Record	Continuous	Record
pH	Twice/month	Grab	Twice/month	Grab
Chronic WET testing	Once/quarter	Composite	Once/quarter	Composite

Table 23				
Parameter	Previous Permit		Final Permit	
	Frequency of Sample	Sample Type	Frequency of Sample	Sample Type
Internal Outfall 002				
Flow	Once/day	Totalizing meter	Once/day	Totalizing meter
FAO	Once/week	Grab	Once/week	Grab
Chromium	Monitoring for Chromium and Zinc is waived during this permit term based upon the certification dated August 15, 2018.			
Zinc				
pH	Once/month	Grab	Once/month	Grab
Internal Outfall 003				
Flow	Once/week	Totalizing meter	Once/week	Totalizing meter
TSS	Once/month	Grab	Once/month	Grab
O&G	Once/month	Grab	Once/month	Grab
pH	Once/month	Grab	Once/month	Grab
Internal Outfall 004				
Flow	Once/discharge	Calculate	Once/discharge	Calculate
TSS	Once/month	Grab	Once/month	Grab
O&G	Once/month	Grab	Once/month	Grab
pH	Once/month	Grab	Once/month	Grab
Internal Outfall 005				
Flow	Once/week	Totalizing meter	Once/week	Totalizing meter
BOD5	Once/month	Grab	Once/month	Grab
TSS	Once/month	Grab	Once/month	Grab
pH	Once/month	Grab	Once/month	Grab
Internal Outfall 006				
Flow	Once/day	Totalizing meter	Once/day	Totalizing meter
TSS	Once/week	Grab	Once/week	Grab
O&G	Once/week	Grab	Once/week	Grab
pH	Once/week	Grab	Once/week	Grab
Internal Outfall 008				
Flow	Once/week	Calculate	Once/week	Calculate
TSS	Once/month	Grab	Once/month	Grab
O&G	Once/month	Grab	Once/month	Grab
pH	Once/month	Grab	Once/month	Grab

Table 23				
Parameter	Previous Permit		Final Permit	
	Frequency of Sample	Sample Type	Frequency of Sample	Sample Type
Outfall 009				
Flow	Once/day	Estimate	Once/day	Estimate
TRO	Twice/month	Grab	Twice/month	Grab
O&G	Twice/month	Grab	Twice/month	Grab
pH	Twice/month	Grab	Twice/month	Grab
Total Recoverable Arsenic	N/A	N/A	Once/quarter (for one year only)	Grab
Outfall 010				
Flow	Once/month	Estimate	Once/month	Estimate
TSS	Once/month	Grab	Once/month	Grab
O&G	Once/month	Grab	Once/month	Grab
pH	Once/month	Grab	Once/month	Grab
Outfall 011				
Flow	Once/month	Estimate	Once/month	Estimate
TSS	Once/month	Grab	Once/month	Grab
O&G	Once/month	Grab	Once/month	Grab
pH	Once/month	Grab	Once/month	Grab
Outfall 012				
Flow	Once/month	Estimate	Once/month	Estimate
TSS	Once/month	Grab	Once/month	Grab
O&G	Once/month	Grab	Once/month	Grab
pH	Once/month	Grab	Once/month	Grab
Outfall 013				
Flow	Once/month	Estimate	Once/month	Estimate
TSS	N/A	N/A	Once/month	Grab
O&G	N/A	N/A	Once/month	Grab
pH	Once/month	Grab	Once/month	Grab
Total Recoverable Arsenic	N/A	N/A	Once/quarter (for one year only)	Grab

15. PERMIT COMPLIANCE SCHEDULE

Compliance with all permit requirements is required on the effective date of the permit.

16. MONITORING AND REPORTING

The applicant is at all times required to monitor the discharge on a regular basis and report the results monthly. The monitoring results will be available to the public.

17. COOLING WATER INTAKE STRUCTURES (CWIS) – CWA § 316(b)

EPA promulgated the rule for cooling water intake structures (CWIS) at existing facilities pursuant to Clean Water Act Section 316(b) on August 15, 2014. The rule became effective on October 14, 2014. The rule includes provisions specifically designed to ensure that the rule, as it is implemented, is not likely to jeopardize the continued existence of federally-listed species, or result in the destruction or adverse modification of designated critical habitat pursuant to the Endangered Species Act of 1973 (ESA). The rule also establishes Best Technology Available (BTA) standards for minimizing adverse environmental impact to reduce impingement mortality and entrainment of aquatic organisms at existing power generation and manufacturing facilities.

Arkansas Nuclear One (ANO) commenced construction prior to January 17, 2002. Therefore, this facility is classified as an existing facility under Subpart J – Requirements Applicable to Cooling Water Intake Structures for Existing Facilities Under Section 316(b) of the Clean Water Act. Existing facilities are subject to requirements under Subpart J if: (1) the facility is a point source, (2) the facility uses one or more CWIS with a cumulative design intake flow of greater than 2 MGD; and (3) twenty-five percent or more of the water the facility withdraws on an actual intake flow basis is used exclusively for cooling purposes. ANO meets all these applicability criteria, therefore is subject to Subpart J – Requirements Applicable to Cooling Water Intake Structures for Existing Facilities Under Section 316(b) of the Clean Water Act.

A letter from DEQ to ANO dated June 29, 2016 contained a summary table which indicated the studies that were required to be submitted with the renewal application. This summary table is shown in Table 24 below. 40 C.F.R. §§ 122.21(r)(2) through (r)(13) studies were required to be submitted for Unit 1 and (r)(2), (r)(3), (r)(4), (r)(5), and (r)(8) studies were required to be submitted for Unit 2.

Table 24					
40 C.F.R. § 122.21	Study Name	New Study Required?		Submitted with Application?	
Permit Application Requirements		**Unit 1**	**Unit 2**	**Unit 1**	**Unit 2**
(r)(2)	Source Water Physical Data	No	No	**Yes**	**Yes**
(r)(3)	Cooling Water Intake Structure Data	No	No	**Yes**	**Yes**
(r)(4)	Source Water Baseline Biological Characterization Data	No	No	**Yes**	**Yes**
(r)(5)	Cooling Water System Data	No	No	**Yes**	**Yes**
(r)(6)	Impingement Technology Performance Optimization Study	**Yes**[2]	No[3]	**Yes**[2]	No[3]
(r)(7)	Existing Entrainment Performance Studies	No	No	**Yes**[4]	No
(r)(8)	Operational Status	No	No	**Yes**	**Yes**
Permit Application Requirements for Units that Intake >125 mgd		**Unit 1**	**Unit 2**	**Unit 1**	**Unit 2**
(r)(9)	Entrainment Characterization Study	No	No	**Yes**[4]	No
(r)(10)	Comprehensive Technical Feasibility and Cost Evaluation Study for Candidate Entrainment Reduction Technologies	**Yes**	No	**Yes**	No
(r)(11)	Benefits Valuation Study for Candidate Entrainment Reduction Technologies	**Yes**	No	**Yes**	No
(r)(12)	Non-water Quality and Environmental Impacts Study for Candidate Entrainment Reduction Technologies	**Yes**	No	**Yes**	No
(r)(13)	Peer Review of (r)(10), (11), (12)	**Yes**	No	**Yes**	No

[2] The new impingement (IM) study included all components in 40 C.F.R. §§ 122.21(r)(6)(ii)(A), (B), (C), and (D), since system of technologies compliance option was chosen. The IM study consisted of two years of data collection with a minimum required data collection frequency of once/month, with daily intake flow measurements at Unit 1, and was required to demonstrate that operation of the system has been optimized to minimize impingement mortality and documented how each system element contributes to the system's performance. ANO was required to submit at least one year of new IM sample results with the renewal application and the second year of sampling was submitted after completion. The renewal permit contains the Department's final BTA determination based on the 2 year IM study.
[3] Pursuant to 40 C.F.R. § 122.21(r)(6), a new two year impingement study was not required for Unit 2 since this unit is a closed cycle recirculating cooling system which is a "pre-approved" technology for complying with the impingement BTA standard in the new 316(b) regulations for existing facilities.
[4] The information submitted with historical existing entrainment studies for Unit 1 was required to include all components in 40 C.F.R. §§ 122.21(r)(9)(i) through (iii).

Unit 1 Compliance with BTA Standards for Impingement Mortality

For Unit 1, the facility has chosen to comply with the impingement mortality BTA standard using a system of technologies in accordance with 40 C.F.R. § 125.94(c)(6). Under this compliance option, the facility may implement a system of technologies, operational measures, and best management practices that may include flow reductions, seasonal operation, unit closure, credit for intake location, and behavioral deterrent systems.

The (r)(6) impingement study was conducted at Unit 1 for a two year period (July 2016 through June 2018). During this study, 99.53% of the total impingement count was comprised of threadfin and gizzard shad (fragile species). In accordance with 40 C.F.R. § 125.94(c)(6), fragile species are not required to be included in demonstrating the system of technologies has been optimized to minimize impingement mortality. These shad species are considered fragile species which are prone to fall die-off when the water temperature reaches 42 ºF. The 316(b) rule does not intend for such naturally occurring mortality to be counted against a facility's performance in reducing impingement mortality. No endangered or threatened species were impinged in the two year impingement study.

Based on the study results, Table 25 shows the daily percent reduction of impinged fish compared to the relative peak abundance of the lake, the Illinois Bayou embayment, and the intake canal:

Table 25
Annual Percent Reduction of Relative Fish Abundance in the 2 Year IM study for Unit 1

Waterbody	Fish Abundance	Annual Number of Non-Fragile Fish Impinged with all 4 pumps	Annual Percent of Non-Fragile Fish Population Impinged with all 4 pumps
Lake Dardanelle	415,712,499	135,780	0.03%
Illinois Bayou Embayment	43,612,560	135,780	0.31%
Intake Canal	2,665,200	135,780	5.09%

Receiving credit for technologies in place such as, the canal reducing the numbers of fish available for impingement; using rates of impingement in lieu of measured mortality (those fish not impinged cannot become part of mortality caused by the intake structure); and comparison of percent impingement rate being less than 24%; are all provided by the Rule to demonstrate optimization. The low rates of impingement for non-fragile species compared to the fish abundance in Lake Dardanelle, Illinois Bayou Embayment, and the intake canal (shown in last column of Table 25 above) are significantly less than the numerical impingement standard (24%) which would otherwise be required by compliance option 7 of the 316(b) rule if the facility had chosen that compliance option.

Based on the results of the two year impingement study, the DEQ has determined that operation of the in-place system of technologies for Unit 1 meets the BTA impingement standard for the systems of technologies compliance option. The following system of technologies in place for Unit 1 include:

- Credit for rotating screen intake location at the end of a 4,400 foot man-made canal away from the primary production zones of the source water;
- Limited fish habitat in the man-made canal (lacks natural structure associated with vegetation, sand/gravel and shallow shoreline) thus limiting the overall productivity and reducing the potential for impingement;
- Limited riparian habitat associated with the man-made canal (no trees/shrubs providing shade or allochthonous input to attract fish);
- Impingement and entrainment data supports low rates of impingement over the baseline conditions in the Illinois Bayou embayment and in Lake Dardanelle, and demonstrates no adverse environmental impact; and
- Use of a shad barrier net during the peak abundance period (October 1st through April 1st) to deter fish from entering the man-made canal.

Operational conditions, reporting conditions, and recordkeeping conditions for utilizing the in-place system of technologies at Unit 1 is included in Part II.16, II.17, II.19, II.20, and II.21 of the permit.

Unit 1 Compliance with BTA Standards for Entrainment

The (r)(10) study evaluated several entrainment reduction technologies such as wet cooling tower(s), dry cooling tower(s), hybrid cooling tower(s), impoundments, water reuse, alternative cooling water sources (groundwater), fine mesh traveling screens with fish return, wedgewire screens, and offshore intake with velocity cap. Of these identified candidate technologies, only the wet cooling tower(s) and fine mesh traveling screens with fish return were determined to be technically feasible.

Based on the r(10) and r(11) studies for the candidate wet cooling tower(s) technology, the total social costs (sum of Tables 33 and 34) (in 2018 dollars) were estimated to be approximately $972.4 million, and the total social benefits (Table 40) were estimated to be approximately $2.6 million. The total social costs for this technology does not justify the total social benefits. Therefore, pursuant to 40 C.F.R. § 125.98(f)(4), the DEQ has determined that retrofitting the current once through cooling system to a closed cycle cooling system with wet cooling tower(s) is not required.

DEQ also evaluated the other candidate entrainment technology of fine mesh screens with fish return. Based on the two year impingement study, 99.53% of the total impingement count was comprised of threadfin and gizzard shad (fragile species). These fragile species are prone to die-off in the fall season caused by low water temperature, which result in these fragile species being moribound or dead upon arrival prior to being impinged on the intake screens. If the facility switched to fine mesh screens with fish return system, the impingement count of these fragile species would increase due to the smaller screen openings. Returning these high numbers of dead or moribound fragile species to the lake would likely have negative visual impacts on the lake and will result in negative public perception impacts on the lake. In addition, the fine mesh screens would increase the potential for screen clogging, which could have detrimental effects on the cooling ability of the

nuclear reactor. In addition, the use of fine mesh screens would not be expected to significantly reduce entrainment of fish eggs and larvae since most eggs and larvae are smaller than 2 millimeters (fine mesh screen openings). Therefore, the DEQ has determined that replacing the current coarse mesh screens to fine mesh screens with fish return system is not required. Operational conditions, reporting conditions, and recordkeeping conditions for utilizing the in-place system of technologies at Unit 1 is included in Part II.15 thru Part II.22 of the permit.

Unit 2 Compliance with BTA Standards for Impingement Mortality

The facility shall meet the BTA Standards for Impingement Mortality at Unit 2 by utilizing a closed cycle recirculating cooling water system, which is a pre-approved technology for impingement mortality reduction pursuant to 40 C.F.R. § 125.94(c)(1). DEQ has determined that continued operation of this closed cycle recirculating cooling system for Unit 2 satisfies the requirements of 40 C.F.R. § 125.94(c)(1). A condition in Part II of the permit has been included that requires the facility to monitor actual intake flow or cycles of concentration at Unit 2 at a minimum frequency of daily in accordance with 40 C.F.R. § 125.94(c)(1), and submit the data with each Discharge Monitoring Report (DMR) in accordance with 40 C.F.R. § 125.97(a). Operational conditions, reporting conditions, and recordkeeping conditions for utilizing the in-place closed cycle cooling system at Unit 2 is included in Part II.15 thru Part II.22 of the permit.

Unit 2 Compliance with BTA Standards for Entrainment

While no specifically prescribed BTA standard is established for entrainment in the 316(b) rule, the site specific conditions and the reduction in water usage associated with the closed cycle cooling system utilized for Unit 2, compared to the once through cooling system utilized by Unit 1, demonstrates that current utilization of a closed cycle cooling system at Unit 2 meets BTA for entrainment reduction as well. Therefore DEQ has determined that the continued operation of a closed cycle recirculating system at Unit 2 satisfies the requirements of 40 C.F.R. § 125.94(d). Operational conditions, reporting conditions, and recordkeeping conditions for utilizing the in place closed cycle cooling system at Unit 2 is included in Part II.15 thru Part II.22 of the permit.

Summary of 40 C.F.R. § 122.21(r) Studies

A summary of information from each study submitted with the permit renewal application is presented on the following pages.

40 C.F.R. § 122.21 (r)(2) - Source Water Physical Data

(i) A narrative description and scaled drawings showing the physical configuration of all source waterbodies used by the facility, including areal dimensions, depths, salinity and temperature regimes, and other documentation that supports your determination of the waterbody type where each cooling water intake structure is located.

Lake Dardanelle is the source water for the cooling water intake structure (CWIS) at Arkansas Nuclear One (ANO). The CWIS is located on the Illinois Bayou arm of Lake Dardanelle at river mile 205 on the Arkansas River near Russellville, Arkansas. Lake Dardanelle has a length of

50 miles from the upstream Lock and Dam #12 (Ozark/Jetta) to the downstream Lock and Dam #10 (Dardanelle). Lake Dardanelle has 315 miles of shoreline, a surface area of approximately 34,000 acres, and a drainage area of approximately 153,703 square miles. The average lake flow is 37,500 cfs and the storage capacity is 486,000 acre-feet. The lake water levels are controlled by the Dardanelle Dam and are held fairly constant year round. Depth across the lake averages approximately 10 feet with maximum depths reaching approximately 60 feet at it southeast end near the Dardanelle Dam. The lake exhibits typical temperature cycles for shallow reservoirs in the southeastern United States. Due to the relatively shallow nature of Lake Dardanelle, few areas are known to exhibit any significant thermal stratification. The nearest USGS water temperature data is located at station USGS 07250550, approximately 85 miles upstream of the ANO CWIS. Water temperatures collected at the CWIS from July 2016 to April 2018 ranged from 0.5ºC to 31.7ºC and followed a similar trend as the upstream USGS station data. Salinity data collected at the ANO CWIS from July 2016 to April 2018 ranged between 0.1 to 0.3 parts per thousand (0.01 to 0.03%).

(ii) Identification and characterization of the source waterbody's hydrological and geomorphological features, and the methods used to conduct any physical studies to determine the intake's area of influence within the waterbody and the results of such studies.

The Arkansas River is the sixth longest river in the U.S. and the second longest tributary of the Mississippi River. The Arkansas River traverses approximately 1,469 miles across Colorado, Kansas, Oklahoma, and Arkansas. The headwaters begin in Colorado and the mouth is located in Napoleon, Arkansas with a drainage basin of approximately 170,000 square miles. The Arkansas River consists of three distinct sections. In the first section, the river runs as a steep mountain river through the Rockies, dropping nearly 4,600 feet in 120 miles. The river valley significantly widens and flattens in Canon City, Colorado before entering the Great Plains regions of Colorado, Kansas, and most of Oklahoma where it become a typical large Great Plains riverway with wide, shallow banks. A major component of the Arkansas River is the MKARNS. The MKARNS system is 447 miles long with 18 locks and dams that create a series of navigation pools that enable vessels to overcome a 420 foot difference in elevation from the Mississippi River to the head of navigation at Catoosa, Oklahoma. In Arkansas, the U.S. Army Corps of Engineers (USACE) manages thirteen locks and dams along the river that create 28 recreational areas and a number of large lakes. The largest lake on the Arkansas River is Lake Dardanelle which was created as part of Dardanelle Lock and Dam No. 10. Lake Dardanelle has a retention time of about seven days and is considered a flow through system rather than a storage reservoir due to daily flow rates and shallow water depths.

The Illinois Bayou is a major tributary stream flowing into the northern side of Lake Dardanelle approximately six miles upstream of the Dardanelle Lock and Dam No. 10. At the confluence of Illinois Bayou and Lake Dardanelle, a large bay area provides shallow water and significant shoreline habitats. A small creek named Mill Creek flows into the bay area in the northwest corner. The headwaters of Illinois Bayou begin in the south slope of the Ozark Mountains in northcentral Arkansas. As the stream leaves the mountains, it is comprised of three separate waterways known as the North Fork Illinois Bayou, Middle Fork Illinois Bayou, and the East Fork Illinois Bayou. These three forks converge into the Illinois Bayou at Bayou Bluff near Hector, Arkansas. From here, the main stem of the stream flows south to Lake Dardanelle.

The hydraulic zone of influence (ZOI) associated with the ANO CWIS was calculated based upon the following source water data information:

- The depth of lake near the intake canal ranges from 12-18 feet. The majority of the intake canal is about 15 feet deep and 50 feet wide.
- Lake Dardanelle has a storage capacity of 486,000 acre-feet.
- The CWIS design intake flow is 1,782 cfs for Unit 1 and Unit 2 combined.

The ZOI was calculated as the cylindrical area where the intake velocity is equal to 10% of the river's horizontal velocity. The Illinois Bayou horizontal velocity at this location was determined to be 0.02 feet per second. The maximum radius of the ZOI was determined to be 1,708 feet from the intake canal at the Unit 1 and Unit 2 combined design intake flow of 1,117 MGD. The ZOI is depicted in Figure 1.

Figure 1



: Expected Hydraulic Zone of Influence at the ANO CWIS

(iii) Locational map

Figure 2



Location of ANO CWIS in Lake Dardanelle

40 C.F.R. § 122.21 (r)(3) - Cooling Water Intake Structure Data

(i) A narrative description of the configuration of each cooling water intake structure and where it is in the water body and in the water column.

The CWIS at ANO supports the facility's 836 MW and 987 MW generating capacity for Unit 1 and Unit 2, respectively. The ANO CWIS is comprised of a cooling water intake canal and the main structure. Cooling water is withdrawn from the Illinois Bayou arm of Lake Dardanelle through a 4,400 foot long intake canal leading to the CWIS main structure. The depth of the lake where the canal originates ranges from 12 to 18 feet deep. The intake canal is approximately 15 feet deep and averages 50 feet in width along its length. At the main intake structure just in front of the intake bays, the canal is 185 feet wide and about 23 feet deep. The highest water velocity in the intake canal is about 3.0 feet per second and occurs at a narrow structure approximately 3,000 feet east of the main intake structure towards the canal mouth opening into the lake.

The CWIS main structure includes bar grates, stop logs, traveling screens, and several pumping systems providing water for cooling purposes and fire protection. The bar grates and stop logs are made of steel with 3 inch spacing to prevent large debris from entering the CWIS. Once the water passes through the bar grates, it goes through the traveling screens. The screens are

designed to remove smaller debris and aquatic organisms, and are made of stainless steel with mesh panels with 3/8 inch openings. The traveling screens rotate vertically and are backwashed with high pressure water to prevent buildup of debris. The debris is transported via a sluiceway to large steel collection baskets which are emptied as needed by an overhead crane.

(ii) Location coordinates of each CWIS:

CWIS (pumps and traveling screens): 35º 18' 32.83"N; 93º 13' 47.98"W
Intake (mouth of intake canal): 35º 18' 34.95"N; 93º 12' 58.37"W

(iii) Narrative description of the operation of each CWIS, including design intake flows, daily hours of operation, number of days of the year in operation and seasonal changes, if applicable:

ANO operates a two-unit facility. Unit 1 utilizes once through cooling and Unit 2 utilizes a closed cycle recirculating system with a parabolic cooling tower. While the two units are each unique to their cooling types and needs, both systems share the cooling water intake canal and main structure of CWIS with exception to the screens and pumps.

Unit 1 has a design intake flow (DIF) of 1,100 MGD (based on four circulating pumps each rated at 191,000 gpm), with a maximum through screen velocity of 2.2 feet per second associated with each of the eight screens. Unit 2 has a DIF of 52 MGD (based on three service water pumps each rated at 12,000 gpm), with a maximum through screen velocity of 0.34 feet per second associated with each traveling screen.

Another component of the CWIS includes the installation of a shad barrier net during the winter months (October 1st through April 1st in accordance with the conditions of the United States Corps of Engineers (USCOE) Nationwide Permit No. 1967-00241-14 issued on April 4, 2018). The barrier net deployment began in 2000, and is installed at the mouth of the intake canal to reduce the impulse of moribound shad due to the cold water temperatures. The barrier net is 1,500 feet long and consists of six replaceable net panels. Each panel is 250 feet long and 20 feet deep with ½ inch mesh net material. The barrier net is attached to both the north and south shores at the end of an arc extending about 150 yards into the Illinois Bayou arm of Lake Dardanelle, and secured along the bottom with 12 regularly spaced concrete blocks serving as buoy anchor points.

The ANO facility is currently listed as a base load facility and operates year-round except for re-fueling. Scheduled re-fueling occurs for each unit every 18 months and is staggered to prevent a dual outage. ANO reported on May 3, 2018 that Unit 1 operated on-line for 1,670 days over the previous five years with an average of 334 days per year, while Unit 2 operated on-line for 1,543 days over the previous five years with an average of 309 days per year.

40 C.F.R. § 122.21 (r)(4) - Source Water Baseline Biological Characterization Data

(i) Identification of available data and sources of data.

The source water baseline biological characterization for Lake Dardanelle was developed utilizing both historical and current biological studies and data collections at the ANO facility and on Lake Dardanelle. Collectively, these studies provide a comprehensive list of species common to these areas, provide an overview of habitat types where fish may occur, and provide the basis for evaluating relative abundances, all of which support the baseline characterization. Additionally, fisheries data from other lakes in Arkansas and data from other power plants with impingement and entrainment data were used to provide a broader overview for developing the baseline characterization.

Multiple years of impingement data were compiled at the facility from 1974 to 1994 for environmental impact statements associated with National Regulatory Commission licensing. The data indicated that only 3.6% of the total fish population of Lake Dardanelle is affected by impingement at the ANO facility. The data also indicated that the most frequently impinged fish species were the gizzard and threadfin shad, comprising 99.3% of the total number of fish impinged and 95.3% of the total weight of fish impinged. The data also indicated that the highest impingement rates occurred from October through March which was attributed to high thermal stress of gizzard and threadfin shad in colder winter and early spring months. This data provides the most comprehensive and long term representation of species susceptible to impingement and entrainment at ANO and provides the baseline for the overall fish population (66 species) associated with Lake Dardanelle.

Annual sampling/population reports for Lake Dardanelle were performed by the Arkansas Game and Fish Commission (AGFC). The reports from 1999 through 2014 were used to support the characterization of the lake's fish community, determine the calculation baseline for the CWIS, and to determine the rate of impingement and entrainment over the baseline.

A two year impingement study was performed at ANO Unit 1 in accordance with 40 C.F.R. § 122.21(r)(6) from July 2016 to June 2018. This study 1) characterizes the fish and and shellfish species collected from impingement samples, 2) determines the presence/absence of any rare, threatened or endangered species impinged, 3) notes the presence/absence of commercially or recreationally important species, 4) provides size data on all impinged species, 5) describes seasonal shifts in species composition, 6) calculates current impingement rates for all species (individually and combined), and 7) provides a basis for determining the levels of optimization for the selected BTA – systems of technologies.

(ii) A list of species (or relevant taxa) for all life stages and their relative abundance in the vicinity of the CWIS. All species should be evaluated, including the forage base and those species most important to commercial and recreational fisheries.

Analysis of the Lake Dardanelle fish population sampling reports conducted by AGFC provides species composition and/or relative abundance of 35 species potentially associated with the ANO CWIS. In the 2014 AGFC report, the relative abundance of the dominant fish

species (identified in order of percent total by weight in Lake Dardanelle were Blue catfish (24.9%), Gizzard shad (17.7%), Threadfin shad (12.6%), Channel catfish (10.9%), Freshwater drum (5.9%), Bluegill (4.5%), Smallmouth buffalo (4.1%), River carpsucker (2.8%), Largemouth bass (2.8%), and Bigmouth buffalo (2.6%).

(iii) Identification of the species and life stages most susceptible to impingement and entrainment.

Susceptibility to impingement and entrainment is dependent upon a variety of interrelated factors including size, life stage, swimming speed, intake flow velocity, rheotaxis, seasonal variation, habitat preference, etc. Studies have shown that smaller, juvenile fish are more susceptible to impingement than their larger, adult counterparts. Young fish often exhibit higher natural mortality or weakened swimming ability due to stresses including extreme water temperature, low dissolved oxygen, strong flow velocity, physical damage, and infectious disease. According to a 2011 EPRI study summarizing the impingement and entrainment of fish and shellfish based on characterization studies performed at 240 facilities across the U.S., the most commonly impinged species in reservoirs located in the southeastern states are those belonging the family of Clupeids which include shad.

Impingement of large fish sizes is predominantly excluded by bar rack structures designed to prevent the entry of trash and debris into the cooling system, such as the bar grates in front of the traveling screens at ANO.

Data from the 2-year impingement study performed at ANO from July 2016 to June 2018 indicate a total of 24 species being impinged. Threadfin shad and Gizzard shad represented 99.6% of the total fish impinged in this study. Additional impingement studies performed at ANO from 1977 to 1989 indicated a similar species composition that were impinged in that Threadfin and Gizzard shad represented 97.4% of the total fish impinged. In these studies, average daytime impingement rates were lower than nighttime rates, and winter months had higher impingement rates than all other months.

Using data provided by the AGFC, the previous Entergy entrainment studies, and the current impingement study, fish species were evaluated to determine those most susceptible to entrainment impacts at ANO. Information related to life histories for each fish species identified in the baseline were assessed to determine spawning habitat preference, period, and frequency. This information was evaluated based on the CWIS location and operation to develop a list of species most susceptible to entrainment at the ANO facility. These species are shown in Table 26 below:

Table 26	
Species Susceptible to Entrainment at the ANO CWIS	
Family	Potential species
Atherinopsidae	Mississippi silverside
Catastomidae	Suckers
Centrarchidae	Bluegill, largemouth bass, black crappie, white crappie
Clupeidae	Threadfin shad, gizzard shad, skipjack herring

Table 26	
Species Susceptible to Entrainment at the ANO CWIS	
Family	Potential species
Cyprinidae	Carp
Ictaluridae	Channel catfish
Moronidae	Striped bass, white bass, yellow bass
Sciaenidae	Freshwater drum

(iv) Identify and evaluate the primary period of reproduction, larval recruitment, and period of peak abundance for relevant taxa.

The following Table 27 shows the typical spawning periods related to each relevant species based on the entrainment studies performed at ANO.

Table 27												
Spawning Periods of Species Susceptible to Entrainment and Impingement at ANO												
Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bigmouth buffalo												
Black crappie												
Blue catfish												
Bluegill												
Channel catfish												
Emerald shiner												
Flathead catfish												
Freshwater drum												
Gizzard shad												
Golden redhorse												
Golden shiner												
Largemouth bass												
Mississippi silverside												
River carpsucker												
Sauger												
Skipjack herring												
Smallmouth buffalo												
Spotted gar												
Striped bass												
Tadpole madtom												
Threadfin shad												
White bass												
White crappie												
Yellow bullhead												

Following the abundance of adults during spawning season, a temporal lag of roughly a month will occur in which there will be a peak in the abundance of larval stages. Entrainment data

collected at ANO from 1977-1982 indicated that peak larval densities and entrainment typically occurred from early April through late June for species including shad, white bass, crappie, sunfish, minnows, carp, drum, silversides, and suckers.

(iv) Data representative of the seasonal and daily activities (e.g., feeding and water column migration) of biological organisms in the vicinity of the CWIS.

Impingement data at ANO in the 2016-2018 study indicates that the largest number of fish are impinged during the winter months from November through February. Earlier impingement studies at ANO in 1982 and 1994 indicate increased numbers of fish impinged occurring as early as October and extending into March. The high numbers of impingement during these months are attributed to increased numbers of gizzard and threadfin shad (>98% of total impingement) becoming stressed from colder water temperatures during these months and making them more susceptible to impingement. Impingement numbers for species other than shad indicate the highest number of fish impinged occurring during the month of May with an additional high peak occurring in December. Based on impingement data at ANO in the 2016-2018 study, the greatest number of species impinged occurred in the months of May and June, and the fewest number of species impinged occurred in the months of February, with both shad included and shad excluded.

Entrainment data from ANO provides information about larval distribution and migration. The entrainment sampling conducted at ANO from 1977 to 1982 included monthly entrainment sampling at three depths (surface, mid-depth, and bottom) at midnight, 8am, and 4pm during each 24-hour period. Over the six year sampling period, larval densities were greatest at night (90.2%), with 4.5% in the morning and 5.3% in the afternoon. All species of larval fish were entrained in the greatest densities during the night samples except for carp which were most numerous in the morning samples. All species of larval fish were entrained in the greatest densities at the surface of the water column except for channel catfish which were most numerous at mid-depth.

(v) Federally-listed threatened and endangered species and/or designated critical habitat that are or may be present in the vicinity of impingement and entrainment at the CWIS.

Review of United States Fish and Wildlife Service (USFWS) Threatened and Endangered List on May 8, 2018 for Pope County identified three protected clam/mussel species and one fish species potentially associated with the ANO CWIS. These species, in addition to the other listed species for Pope County, are shown in Table 28 below. No critical habitat was identified in the vicinity of the ANO CWIS.

Table 28
USFWS Threatened and Endangered Species in Pope County

Type	Common name	Scientific name	Status
Bird	Piping plover	*Charadrius melodus*	Threatened
	Least tern	*Sterna antillarum*	Endangered
Mussel	Speckled pocketbook	*Lampsilis streckeri*	Endangered

Table 28			
USFWS Threatened and Endangered Species in Pope County			
Type	Common name	Scientific name	Status
	Rabbitsfoot	*Quadrula cylindrica cylindrica*	Threatened
	Snuffbox mussel	*Epioblasma triquetra*	Endangered
Insect	American burying beetle	*Nicrophorus americanus*	Endangered
Mammal	Northern Long-eared bat	*Myotis septentrionalis*	Threatened
	Indiana bat	*Myotis sodalis*	Endangered
	Gray bat	*Myotis grisescens*	Endangered
	Ozark big-eared bat	*Corynorhinus townsendii ingens*	Endangered

(vi) Documentation of any public participation or coordination with Federal or State agencies undertaken.

Pursuant to Subpart J – Requirements Applicable to Cooling Water Intake Structures for Existing Facilities Under Section 316(b) of the Clean Water Act [40 C.F.R. § 125.98(h)], the Division of Environmental Quality (DEQ) transmitted the NPDES permit renewal application via email to the US Fish and Wildlife Service (USFWS) for a 60-day review period on July 9, 2018. This facility is an existing facility operating a CWIS, thus is subject to the EPA promulgated 316(b) rule for existing facilities that became effective on October 14, 2014 (40 C.F.R. Part 125, Subpart J). EPA previously performed formal consultation under ESA Section 7 for this rulemaking, and this consultation concluded with issuance of a joint USFWS-NMFS biological opinion on May 19, 2014. The biological opinion requires DEQ to submit NPDES permit applications for existing facilities subject to Subpart J to the appropriate field offices of USFWS for an initial 60-day review period. This 60-day review period is required to be completed prior to the draft permit being public noticed. During this 60-day review period, DEQ requested that USFWS consider providing the following:

- Any corrections to the list of Federally-listed threatened and endangered species and critical habitat included in the permit application,
- Any control measures that the USFWS recommend for the protection of listed species, including any control measures that would minimize any incidental take of listed species, and/or avoid likely jeopardy to a listed species or destruction, or adverse modification of critical habitat, and/or
- Notify the DEQ that the USFWS have no corrections to the list of species and critical habitat and/or that the USFWS does not recommend any control measures.

The USFWS stated on September 19, 2018 that the agency did not have any corrections to the list of endangered or threatened species and critical habits in the application, and the agency had no additional recommendations for control measures at this facility.

The USFWS was also sent the draft permit/fact sheet for review at the time of the 30-day public notice period, during which USFWS had another opportunity to review and make recommendations. The USFWS responded on October 11, 2023 that they have no comments.

ANO also met with DEQ on several occasions (August 2015, January 2016, March 2016, and October 2017 to discuss the compliance path for ANO regarding the 316(b) Rules. DEQ issued a letter dated June 29, 2016 to the facility providing the compliance pathway including a table summarizing the studies that must be completed and included in the renewal application which was due on June 30, 2018 (see Table 24 of this Fact Sheet).

(vi) Identification of fragile species, as defined at 40 C.F.R. § 125.92, found at the facility.

Fragile species are defined as those with an impingement survival rate of less than 30 percent, including but not limited to, Alewife, American shad, Atlantic herring, Atlantic Long-finned squid, Atlantic menhaden, Bay anchovy, Blueback herring, Bluefish, Butterfish, Gizzard shad, Grey snapper, Hickory shad, Menhaden, Rainbow smelt, Round herring, and Silver anchovy.

Impingement mortality data from the historic studies and the current study indicates fragile species found at the ANO CWIS are comprised of species in the Clupeidae family that include Gizzard shad, Threadfin shad, and Skipjack herring.

40 C.F.R. § 122.21 (r)(5) - Cooling Water System Data

The ANO facility is currently listed as a base load facility and operates year-round except for re-fueling. Scheduled re-fueling occurs for each unit every 18 months and is staggered to prevent a dual outage. ANO reported on May 3, 2018 that Unit 1 operated on-line for 1,670 days over the previous five years with an average of 334 days per year, while Unit 2 operated on-line for 1,543 days over the previous five years with an average of 309 days per year.

ANO operates two electricity generating units. Unit 1 utilizes once through cooling and Unit 2 utilizes a closed cycle recirculating system with a parabolic natural draft cooling tower. While the two units are each unique to their cooling types and needs, both systems share the cooling water intake canal and main structure of CWIS with exception to the screens and pumps. ANO water usage also includes input from the City Corporation Public Water System for their potable water, sanitary wastewater, and ultrapure water systems.

Unit 1 has a design intake flow (DIF) of 1,100 MGD (based on four circulating pumps each rated at 191,000 gpm), with a maximum through screen velocity of 2.2 feet per second associated with each of the eight traveling screens. The Unit 1 condenser is designed to remove heat from the condenser and discharge it to Lake Dardanelle. During this single pass through the condenser, the water temperature increases about 10º to 15ºF.

Unit 2 has a DIF of 52 MGD (based on three service water pumps each rated at 12,000 gpm), with a maximum through screen velocity of 0.34 feet per second associated with each of the two traveling screens. Unit 2 operates by rejecting heat from the condenser to the atmosphere through the cooling tower. The system contains over 7 million gallons of water pumped from the condenser to the cooling tower and back at a rate of 500,000 gpm via a 132-inch diameter pipeline. The cooling water temperature increases about 30ºF as is pass through the condenser. The Unit 2 recirculating condenser cooling system requires 16,000 gpm (23 MGD) of water from Lake Dardanelle to offset losses due to cooling tower evaporation, drift, and blowdown. The remainder is discharged to the

discharge canal to Lake Dardanelle.

The water volume difference based on DIF between ANO's once-through cooling system associated with Unit 1 of 1,100 MGD and the closed-cycle recirculating cooling system associated with Unit 2 of 52 MGD, accounts for a 95.3% reduction in water usage associated with Unit 2 compared to Unit 1. The Unit 1 proportion of Lake Dardanelle withdrawn by the facility accounts for approximately 4.53% (based on average daily flow at Dardanelle Lock and Dam of 37,500 cfs and pump rate of 1,100 MGD). The Unit 2 proportion of Lake Dardanelle withdrawn by the facility accounts for approximately 0.21% (based on average daily flow at Dardanelle Lock and Dam of 37,500 cfs and pump rate of 52 MGD).

Because Unit 2 utilizes a pre-approved technology for impingement reduction (closed-cycle recirculating), it is considered to be compliant with impingement BTA requirement. While no prescribed BTA standard is established for entrainment in the 316(b) rule, the site specific conditions and the 95.3% reduction in water usage associated with the closed cycle cooling system (compared to the once through cooling system utilized by Unit 1) demonstrates that current operations of a closed cycle cooling system at Unit 2 meets BTA for entrainment reduction as well.

Unit 1 benefits from a combination of existing impingement reduction technologies that include: 1) traveling screens located at the end of a 4,400 foot long man-made canal away from the primary production zones of the source water, 2) limited fish habitat of the man-made canal (i.e. lacks natural structure associated with vegetation, sand/gravel, and shallow shoreline), 3) limited riparian habitat associated with the man-made canal (i.e. no trees/shrubs providing shade or allochthonous input), and 4) deployment of a shad barrier net at the mouth of the man-made canal.

40 C.F.R. § 122.21 (r)(6) - Impingement Technology Performance Optimization

This study was only required for Unit 1. Pursuant to 40 C.F.R. § 122.21(r)(6), a new two year impingement study was not required for Unit 2 since Unit 2 is a closed cycle recirculating cooling system which is a "pre-approved" technology for complying with the impingement BTA standard for existing facilities.

(i) Identify the compliance method for the entire facility or, alternatively, the compliance method for each CWIS at the facility.

For Unit 1, ANO's compliance method for the impingement mortality standard is the "systems of technologies" compliance option. The systems of technologies used for Unit 1 include:

1) Operation of travelling screens at the end of a 4,400 foot long man-made canal away from the primary production zones of the source water;
2) Limited fish habitat in the man-made canal (lacks natural structure associated with vegetation, sand/gravel, and shallow shoreline), thus limiting the overall productivity and reducing the potential for impingement;
3) Impingement data supports low rates of impingement over the baseline conditions in Illinois Bayou embayment and in Lake Dardanelle; and
4) Use of a shad barrier net during the winter months (peak abundance period).

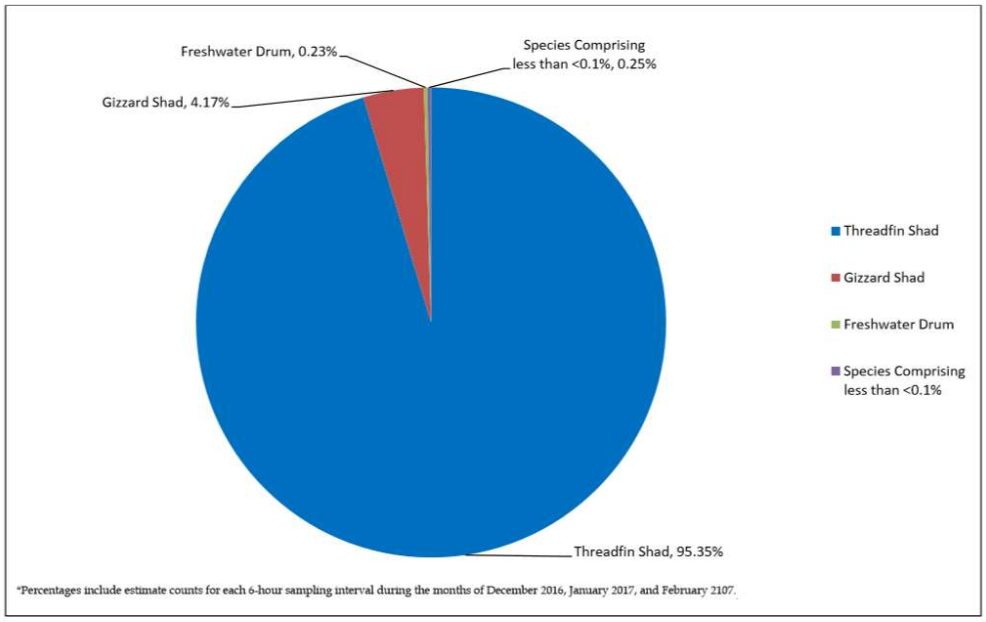
For Unit 2, ANO's compliance method for the impingement mortality standard is the use of a closed-cycle recirculating cooling system. The facility will also monitor the intake flows for Unit 2 at a minimum frequency of daily, and submit the data with their discharge monitoring reports (DMRs).

(ii) Impingement Technology Performance Optimization Study.

ANO performed a 2-year impingement technology performance optimization study for Unit 1 from July 2016 through June 2018 to evaluate BTA technologies currently in place to demonstrate the systems of technologies being utilized reduces the number of organisms that are potentially impinged, resulting in a reduction in the rate of impingement. Specifically, ANO studied the intake location and the use of the barrier net.

The following figure 3 shows the percent abundance for fish impinged during the two year study:

Figure 3



Percent Abundance for Fish Impinged from July 2016 through June 2018

During the 2-year impingement study, 27 species representing ten families were impinged of which three species, threadfin shad, gizzard shad, and freshwater drum comprised 99.75% of the total fish impinged. No threatened and endangered species were impinged, and recreational or commercial fish species comprised 0.33%. The winter months had the highest numbers of impinged fish species. Daytime samples typically had lower number of fish impinged than nighttime samples.

The impingement data demonstrated that shad species represented the highest number of fish impinged and were the dominant species impinged in each of the sample events over the two

years of study. Additionally, moribound shad impingement had relative significant increases (72% and 95%) in impingement numbers during the months of November and December 2017 as compared to the remaining sample months. The high number of impinged moribound shad on the screens at ANO can be attributed to extreme cold weather conditions that occurred in the winter of 2016 through early 2017. Temperatures in Lake Dardanelle dropped from 17.3 ºC in November 2016 to 6.1 ºC in December 2016 and then remained below 12.6 ºC through February 2017. Temperatures in this range make species such as shad vulnerable and more susceptible to impingement.

The removal of the shad (fragile species) from a facility's performance on reducing impingement mortality is allowed by the EPA 316(b) Rule due to their naturally occurring mortality associated with low water temperatures. As such, threadfin, gizzard, and Alabama shad were removed from the calculated rates of impingement to provide impingement numbers representative of non-fragile species.

Based on the study results, the following Table 29 shows the daily percent reduction of impinged non-fragile fish compared to the relative peak abundance of the lake, the Illinois Bayou embayment, and the intake canal:

Table 29
Annual Percent Reduction of Relative Fish Abundance in the 2 Year IM study for Unit 1

	Fish Abundance	Annual Number of Non-Fragile Fish Impinged with all 4 pumps	Annual Percent of Non-Fragile Fish Population Impinged with all 4 pumps
Lake Dardanelle	415,712,499	135,780	0.03%
Illinois Bayou Embayment	43,612,560	135,780	0.31%
Intake Canal	2,665,200	135,780	5.09%

In addition to the 2-year impingement study (2016-2018), data from historical fisheries (1977-1989) were used to provide a historical baseline for potential impingement at ANO and to demonstrate the location of the ANO CWIS at the end of the intake canal provides for an overall reduction in potential impingement. Based on the data, a reduction in potential impingement of 62% by the number of fish species (64 species in the lake compared to 24 species impinged) and a reduction of 99.6% in total fish (number of fish in the intake canal compared to number of fish in the Illinois Bayou embayment) occurs as a result of the ANO CWIS being located at the end of the intake canal.

ANO also completed an evaluation of the current and historical impingement data to determine the effectiveness and overall optimization of the shad barrier net, which is currently permitted to be used during the cooler months (October 1st through April 1st) when the period of peak

abundance of impingement typically occurs. When comparing the data inter-annually (current monthly data to each month of each year, i.e. January 2017 to January 1979, or January 2018 to January 1980) there is significant variability between reductions and numbers of fish impinged. This kind of variability was evident across all months and all years. Given this range of variability in the inter-annual data, no distinct trend in impingement reductions could be identified in the current impingement study that would be directly related to use of the barrier net. A number of explanations can be attributed to this variability:

- Shad abundances are highly variable from month to month and year to year in the lake which can sway the inter-annual and annual comparisons;
- Barrier net mesh size (1/2 inch square mesh) may allow smaller size fish to swim through;
- Existing boat access opening (15 feet wide minimum) allows fish (especially schooling fish species such as shad) to directly enter the intake canal;
- Existing cork/float line does not prevent fish from going over the top of the net and entering intake canal.

In conclusion, the current 2-year impingement optimization study and the use of the historical impingement data supports ANO's use of a system of technologies as the basis for impingement BTA compliance. While the use of the barrier net, based upon this current study, did not demonstrate standardized rate or percent reduction in impingement, the location of the CWIS at the end of a 4,400 foot long intake canal showed significant reduction (greater than 90%) in impingement over the baseline indicating the value of this technology as the key component for meeting the impingement BTA standard under a system of technologies. Based on this two year impingement characterization study, the impingement rates support current in-place system of technologies as the best technology available for ANO.

40 C.F.R. § 122.21 (r)(7) - Existing Entrainment Performance

Entrainment of larval fish at ANO was monitored between 1977 and 1987. During 1981, samples were collected two or three times per week resulting in 110 samples collected during the twelve month period. The objective of the monitoring program was to determine the species composition and abundance of larval fish entrained at ANO. Results of these studies correlated with standing crop fish community data collected from Lake Dardanelle. The results indicate that the entrainment of fish from Lake Dardanelle does not adversely affect population levels. For most of the years monitored, over 95% of the entrained larval fish were Clupeidae (gizzard shad and threadfin shad). About 5% of the entrained larval fish were carp, suckers, white bass, and freshwater drum. These historical studies concluded that the entrainment losses do not adversely affect the Clupeidae population or any other populations of fish or aquatic organisms in Lake Dardanelle.

40 C.F.R. § 122.21 (r)(8) - Operational Status

ANO is operated by two pressurized water reactors equipped with nuclear steam supply systems manufactured by Babcock and Wilcox. ANO Unit 1 consists of a reactor building, an auxiliary building, and a common turbine building shared with ANO Unit 2. ANO Unit 1 has a generating

capacity of 836 MW, while Unit 2 has a generating capacity of 987 MW.

ANO commercial operations commenced in 1974. During a recent five year period (2013-2017), ANO had an average capacity utilization of 83% for Unit 1 and 81.8% for Unit 2. A breakdown of the capacity utilization by year for 2013-2017 is shown in Table 30 below:

Table 30		
Capacity Factor % (Based on MW)		
Year	Unit 1	Unit 2
2013	59.8	85.8
2014	96.8	83.7
2015	88.3	83.9
2016	76.7	88.8
2017	93.2	66.8

ANO has experienced planning outages and has not had any lengthy unplanned or forced outages during the operating period from January 2013 through December 2017 that would affect current data for flow, impingement, or entrainment. Major upgrades occurring within the past 15 years include an upgrade of cooling by 7% on ANO Unit 2, a debris truss was added to the intake canal that stops large floating objects to benefit both units, and a barrier net placed to prevent shad and other debris from overloading the screens. Unit 2 added service water prescreens to the intake structure just downstream of the traveling screens.

ANO is not a manufacturing facility and therefore is not required to provide current and future production schedules. ANO does not have any plans or schedules for decommissioning, replacement of units, or any new units within the next five years. ANO Unit 1 renewed its Nuclear Regulatory Commission (NRC) license on June 20, 2001 with an expiration date of May 20, 2034. ANO Unit 2 renewed its NRC license on June 30, 2005 with an expiration date of July 17, 2038.

40 C.F.R. § 122.21 (r)(9) - Entrainment Characterization

(i) Entrainment data collection method

Arkansas Power and Light Company (APLC) conducted an entrainment study from 1977 through 1987. Over this 10-year period, entrainment sampling at ANO was conducted to determine the impact of this loss on Lake Dardanelle. The Nuclear Regulatory Commission (NRC) established the technical specifications for entrainment monitoring at ANO. The criteria included replicated sampling at the most narrow point in the intake canal with an appropriately sized meter net, once per month, three times per 24-hours at three depths. Sample collection times were 0800 hrs, 1600 hrs, and 0000 hrs. The greatest larval densities occurred at night with 90.2%, with 4.5% in the morning, and 5.3% in the afternoon. The study documented a mean density of 96 fish larvae entrained per 100 m^3 of water volume sampled. This study also documented the vertical distribution of species to be concentrated at mid-depth and bottom during daylight hours with migration to the surface at night. The greatest density was at the surface with the least density at mid-depth and bottom. During six years of this study (1977

through 1982), meter net data was also collected from four lake sites to determine the impact of entrainment associated with ANO. These lake samples were taken during daylight hours, at the surface, and were replicated. Lake samples were once per week from mid March through June, and biweekly from July through mid September. The study documented a mean density of 139,445 larvae collected per 100 m^3 of water volume sampled from all four sites combined and determined the collection site proximal to the intake canal was the least productive of the four lake sites sampled.

The study concluded that 0.069% of Lake Dardanelle fish were entrained by ANO. It was determined that since the Clupeid (shad) species were the dominant entrained larvae, and since the species has been able to reestablish itself in the intake area and the lake each year, it does not appear that entrainment losses is having a significant impact on the shad, nor is there any evidence that entrainment losses have had a significant impact on the other species of fish observed. Table 31 below shows the species and life stages entrained in the APLC entrainment study:

Table 31
List of Species and Life Stages for Fish Entrained at ANO
APLC study 1977-1987

Taxa	Common Name	Life Stage
Clupeidae	Shad	Larvae
Dorosoma cepedianum	Gizzard shad	Larvae
Dorosoma petenense	Threadfin shad	Larvae
Alosa chrysochloris	Skipjack herring	Larvae
Cyprinidae	Minnows	Larvae
Ictalurus punctatus	Channel catfish	Larvae
Moronidae	Temperate bass	Larvae
Morone saxatilis	Striped bass	Larvae
Lepomis sp.	Sunfish	Larvae
Pomoxis sp.	Crappie	Larvae
Pomoxis nigromaculatus	Black crappie	Larvae
Atherinidae	Silversides	Larvae
Labidesthes sicculus	Brook silverside	Larvae
Menidia audens	Mississippi silverside	Larvae
Catastomidae	Suckers	Larvae
Carp	Carp	Larvae
Aplodinotus grunniens	Freshwater drum	Larvae
Gambusia affinis	Mosquitofish	Larvae
Percidae	Perch	Larvae

Stoeckel and Gagen conducted a study in Lake Dardanelle during March-September 1994 with meter net trawls to determine larval fish diversity and abundance at four sites in the lake. Samples were collected from each of two, five minute meter net trawls at each site. The maximum larval density of Clupeids (shad species) from all four sites was approximately 150 organisms per 100 m^3 water volume sampled in May with a maximum larval density of

approximately 55 organisms per 100 m^3 water volume on non-Clupeids (other than shad) sampled in June. The study documented 11 taxa and life stage which are shown in Table 32 below.

Table 32
List of Species and Life Stages for Fish Entrained at ANO
Stoeckel and Gagen Study 1994

Taxa	Common Name	Life Stage
Atherinidae	Silverside	Larvae
Catastomidae	Sucker	Larvae
Clupeidae	Shad	Larvae
Cyprinidae	Minnow	Larvae
Ictaluridae	Catfish	Larvae
Lepomis sp.	Sunfish	Larvae
Micropterus	Bass	Larvae
Moronidae	Temperate bass	Larvae
Percidae	Perch	Larvae
Pomoxis sp.	Crappie	Larvae
Sciaenidae	Drum	Larvae

While not a component of any structured entrainment study, the AGFC (1995) through their years of resource management of Lake Dardanelle, concluded in a letter to ANO that at the termination of a 20-year ecological survey project on the lake, that entrainment losses at ANO have not affected the maintenance of a quality recreational fishery in Lake Dardanelle.

(ii) Biological Entrainment Characterization

In the APLC studies (1982 and 1987) and the Stoeckel and Gagen study (1994) performed on Lake Dardanelle, the life stages of all entrained fish taxa collected were larvae. No threatened and endangered fish species were collected. Based upon established life history information (Robinson and Buchanan, 1992) and the other historical entrainment studies conducted on Lake Dardanelle, these studies represented periods related to climate, annual fish movement, seasonal spawning patterns, and subsequent larval fish densities. Based on historical entrainment studies performed at ANO, the primary spawning periods for fish species in Lake Dardanelle occurs primarily during March through July. As such, it is expected that eggs and larval recruitment would occur over the next 30-45 days. Diel patterns of larval fish migration in the water column relates to vertical movement of larval fish downward in the daytime and movement up in the water column during the nighttime. Vertical movement of fish larvae is tied to predation escape, light sensitivity (related to lack of pigment) and zooplankton movement. In the historical entrainment studies, no surrogate species were used and no non-motile life stages were collected. All fish species entrained at ANO are considered to be dead or moribound with no measured latent mortality.

40 C.F.R. § 122.21 (r)(10) - Comprehensive Technical Feasibility and Cost Evaluation Study for Candidate Entrainment Reduction Technologies

This study is required for units with actual intake flow greater than 125 MGD. This study was required for Unit 1 because this unit has an actual intake flow of 914.9 MGD. This study was not required for Unit 2 because this unit has an actual intake flow of 19.4 MGD. Therefore, the following discussion relates only to Unit 1.

(i) Identified candidate technologies and feasibility factors considered.

A summary of the following candidate technologies is discussed below:

- Surface cooling impoundments
- Dry cooling system
- Hybrid cooling system
- Alternative cooling water source
- Wet cooling towers
- Fine-mesh traveling screens

The following feasibility factors were considered for each candidate technology:

- Proven biological efficacy (technology has been shown to be effective at reducing entrainment in a commercial application)
- Construction and engineering considerations (what new equipment or extensive modification of existing systems would be required for the technology)
- Conformance to existing environmental conditions (is there sufficient land and/or resource availability for the technology)
- Potential environmental impacts and permitting considerations (does installation of the technology result in impacts to wetlands, water quality, air quality, etc. that require extensive permitting or mitigation efforts)
- Public health and safety concerns (worker safety, sensitive receptors for noise and environmental impacts at adjacent properties)
- Necessity of U.S. Nuclear Regulatory Commission (NRC) approvals for material alteration of a licensed facility and associated safety systems and license amendment as required by 10 C.F.R. Part 50

Surface Cooling Impoundments

The use of closed-cycle surface cooling impoundments is limited in Arkansas due to the high ambient temperatures and the large amount of surface area needed to effectively dissipate heat via radiation and evaporation. A successful system typically requires a very large manmade reservoir with dikes or baffles to isolate the heated discharge from the cooler areas of the impoundment. The dikes and baffles increase the residence time and distance the heated effluent travels so that it cools sufficiently prior to reaching the cooling water intake. The heated effluent primarily cools through evaporation, which results in concentrated minerals

and suspended solids that may require blowdown discharges. The evaporation and blowdown discharges results in water losses within the cooling system that must be replaced with make-up water. The ANO Unit 2 Final Environmental Statement (FES) indicated that a 2,000 acre pond would be required to provide adequate cooling for Unit 2 (USNRC 1977). Unit 1 would likely require a similarly sized cooling pond based similar generation capacity. The 1977 FES indicated that the size of the cooling pond could be reduced to 120 acres by utilizing a spray cooling system, at a cost of $22 million ($94.66 million in 2019 dollars), but rejected this alternative due the land required and high capital cost. Review of aerial imagery of the facility indicates there are not 120 contiguous undeveloped acres at the site to accommodate a spray cooling impoundment. Due to the lack of available land, this technology is considered technically infeasible at ANO and is not carried forward for further analysis.

Dry Cooling System

Typical dry cooling systems use large fans to generate air flow to condense the steam as it flows through finned tubes in air-cooled condensers (ACC). Cooling water is not needed because the steam is condensed as the heat is transferred directly to the air by means of convection. These systems are less effective than wet cooling systems in certain environments, particularly hot climates. The ambient air temperature is typically a limiting factor. The resulting higher steam-condensing temperature causes higher turbine backpressure, which leads to lower plant efficiency and reduced output. The ANO Unit 2 FES (USNRC 1977) stated that the use of a dry cooling system will result in operation of the turbine at higher backpressures than with once through cooling, which in turn would increase potential for mechanical problems on the steam turbine blade rows as well as significantly impact unit efficiency. Furthermore, dry cooling is generally used for installation only in areas where water is not readily available. At ANO, there is sufficient water available from Lake Dardanelle to support a wet cooling tower. Based on the results of previous studies and the site specific conditions at ANO, dry cooling does not provide significant advantages over the use of wet cooling towers and result in additional deleterious effects on facility performance. Therefore, retrofit of Unit 1 with a dry cooling system is considered technically infeasible at ANO and is not carried forward for further analysis.

Hybrid Cooling System

Hybrid cooling systems are intended to reduce the amount of cooling water required by using dry cooling during cooler periods of the year and supplementing the dry capability with wet cooling during hotter periods when dry cooling systems cannot maintain as low a turbine exhaust pressure as is desired. The wet and dry components can be arranged in series or parallel as separate structures or integrated into a single tower. The most common configuration to date has been parallel, separate structures with direct dry cooling (EPRI 2013). Similar to dry cooling, hybrid cooling systems would not provide significant advantages over the use of wet cooling towers. Although costs and facility performance impacts may be slightly lower than dry cooling, they would still be higher than the utilization of all wet cooling towers, and would be more difficult to install. Hybrid cooling systems were not evaluated by the ANO FES, but studies at other Entergy power facilities in the South have discounted them as not being viable due to high cost, low effectiveness at ambient temperatures and relative humidity, as well as

higher parasitic load, less efficiency, and a larger footprint when compared with wet cooling towers. Therefore, the retrofit of ANO Unit 1 with a hybrid cooling system is considered technically infeasible, and is not carried forward for further analysis.

Alternative Cooling Water Source

There are no alternate sources of water of sufficient volume to continue using once through cooling. Therefore, this analysis focuses on make-up water needed for a Closed Cycle Recirculating System (CCRS) to replace once through cooling. Available make-up water sources in the vicinity of ANO include Lake Dardanelle, wastewater from POTW, Unit 2 cooling tower blowdown, and groundwater, if adequate supply is available.

Lake Dardanelle is managed by the McClellan-Kerr Arkansas River Navigation System (MKARNS) that is a lock and dam inland waterway system operated by the U.S. Army Corps of Engineers (USACE). The USACE manages the operation of the locks, traffic along the waterway, as well as flow management to augment low flows and reduce high flows on the Arkansas and Mississippi Rivers. Lake Dardanelle currently supplies once through cooling water to Unit 1, therefore this lake is the preferred water source of make-up water to any new CCRS for Unit 1. Additional pipeline infrastructure would be required to convey the lake water to any new CCRS for Unit 1. Additional water treatment for the Unit 1 and Unit 2 blowdown may be required to remove total dissolved solids in the blowdown prior to discharge to the lake.

The City Corporation operates the POTW for the City of Russellville. The POTW is located 7.5 miles southeast of the ANO facility. The POTW has a design capacity of 7.3 MGD. Although this water may be available for re-use at ANO, it is of insufficient volume to satisfy the make-up needs of Unit 1 if equipped with a CCRS (estimated at 19.4 MGD). Furthermore, construction of a pipeline through Russellville to convey the water to ANO would be difficult and costly due to the distance and terrain and low amount of water available. Therefore, reuse of water from the POTW is not considered a viable water source for cooling tower make-up water.

The cooling water blowdown from Unit 2 results in up to 4 MGD of water that may be available for re-use. However, this water volume is insufficient to satisfy the make-up water needs of Unit 1 if equipped with cooling towers. Furthermore, the TDS concentration of cooling tower blowdown is rejected from the recirculating cooling system by design, and is therefore not suitable for reuse as makeup water for conventional cooling towers without additional treatment. Therefore, the use of Unit 2 blowdown is not considered a viable water source for cooling tower makeup water at Unit 1.

Groundwater is another potential source of alternative cooling water. According to USGS information, the Arkansas River Valley alluvial aquifer is the local source of public supply water. The City of Dardanelle uses this aquifer for public supply with production from nine wells with an average yield of 200 gpm (0.288 MGD). Based on the USGS data, the average well yield in the vicinity of ANO is not capable of producing a sufficient volume of makeup water for new cooling towers at ANO Unit 1. Cooling towers serving Unit 1 would require

19.4 MGD for makeup water. Using an average well yield of 0.288 MGD would require approximately 68 wells to produce the required volume of makeup water. It is unlikely that there is sufficient land available around ANO for the 68 wells that would be required to produce 19.4 MGD, as spacing requirements outlined in the Arkansas Water Well Construction Commission Rules and Rules require setbacks of 100 feet from sources of contamination and 100 feet from potable water wells. The potential for local aquifer drawdown, competing groundwater use by the City of Dardanelle, and irrigation and private wells for other adjacent landowners, make this water source impractical. Additionally, the additional drawdown of ground water could potentially impact water levels in Lake Dardanelle due to the recharging the lake provides to some of the aquifers.

Wet Cooling Towers

A wet cooling tower system installed at ANO Unit 1 would differ from the existing once-through system in that the heated cooling water would not be returned to Lake Dardanelle, rather conveyed to the cooling tower, where it is cooled and then recirculated to the condenser. Wet cooling towers may utilize a variety of air flow methods including hyperbolic (natural draft), mechanical forced draft, or mechanical induced draft. Natural draft cooling towers utilize air flow produced by the density differential that exists between the heated (less dense) air inside the tower and the relatively cool (more dense) ambient air outside the tower. These towers tend to be quite large and in excess of 500 feet in height.

Mechanical draft towers use fans to force or draw air through the circulated water. The water falls over fill surfaces which helps increase the contact time between the water and the air, maximizing the heat transfer. Fill material is typically comprised of sheets of plastic in a ridged or wrinkled pattern (film fill) or layers of wood, metal, or plastic bars (splash fill). A portion of the water evaporates which cools the remainder of the water. ANO could utilize either a natural draft cooling tower similar to Unit 2, or mechanical draft towers for closed cycle cooling. There have been significant advancements in mechanical draft cooling tower technology since the ANO Unit 2 tower was constructed. Analysis of aerial imagery indicates there may be sufficient land areas to the west of the existing Units to accommodate either a large hyperbolic natural draft cooling tower, large circular mechanical draft towers, or several linear banks of low-profile mechanical draft towers. Therefore, the installation of wet cooling towers is technically feasible.

The existing natural draft hyperbolic cooling tower for Unit 2 has a circular footprint with a diameter of approximately 500 feet, or approximately 4.5 acres. Other Entergy plants in Arkansas employing multiple hyperbolic cooling towers have required a setback distance of a minimum of 800 feet between the center of each cooling tower to allow for proper thermal-flow performance and temperature fields of cooling air. Therefore, it is assumed that a new natural draft cooling tower for Unit 1 would also need to be located a minimum of 800 feet from the existing tower. Mechanical draft cooling towers are not as tall as a natural draft tower, but would likely require multiple towers with a larger footprint. The Entergy River Bend Nuclear Generating Station employs four mechanical draft cooling towers that have a footprint of approximately 9 acres to cool its 967 MW Unit 1. As ANO Unit 1 is 836 MW, it is assumed that similarly sized mechanical draft towers and footprints would be required. The new wet

cooling tower(s) would require new circulating water lines and connections for a majority of the routing. The lines would likely be placed in a corridor running west from Unit 1 and between the two buildings near the main entrance, then to the new cooling tower location. To minimize circulating water line routing and distance, the preferred location for the new cooling tower(s) (Alternative 1) would be at the existing parking lots located west of the facility and south of the existing cooling tower. However, this would require relocating the parking areas and potentially an access road to a different location on the Entergy property. Alternative 2 is the undeveloped area between the firing range and the existing parking lots. However, this area may not be of sufficient size to accommodate the cooling towers unless portions of the firing range or existing parking lots can be utilized and would require longer circulating water lines. Alternative 3 would be to locate the new towers between the existing tower and the emergency cooling pond to the north of the existing tower. This location is not preferred due to the proximity to the emergency cooling system, potential necessity of relocation of an existing road, and a more difficult routing the circulating water lines. Alternative 1 is approximately 7.5 acres, Alternative 2 is approximately 4.5 acres, and Alternative 3 is approximately 5.5 acres. In the event that mechanical draft cooling towers were installed, they would require the utilization of both Alternatives 1 and 2 due to the larger footprint. An aerial image showing the current land conditions and potential cooling tower locations is shown in Figure 4 below:

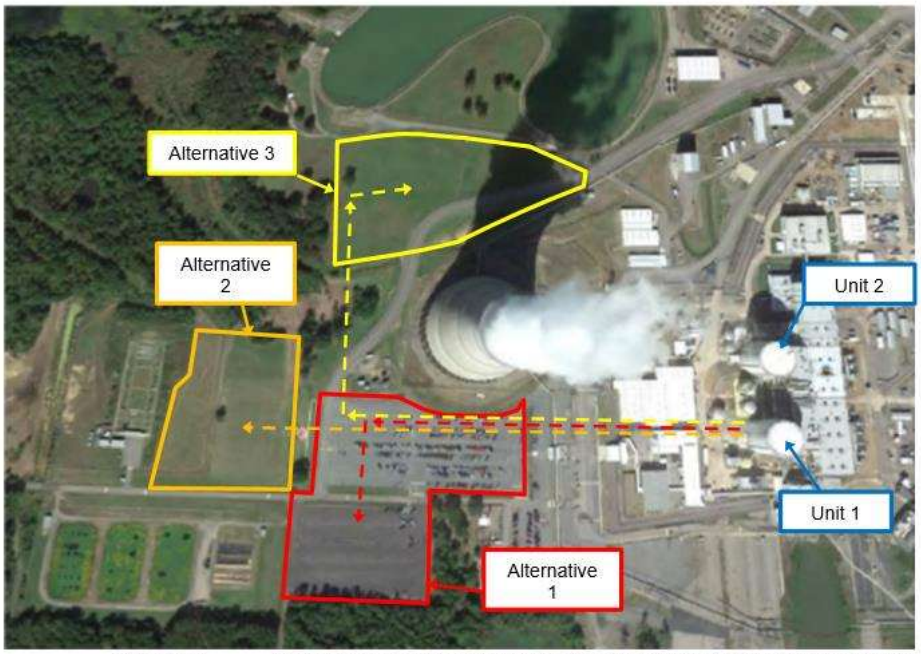


Figure 4. Potential Locations for Wet Cooling Towers and Circulating Water Lines

A variety of additional factors other than cost that may make the installation of wet cooling tower(s) impractical or infeasible were considered, including the parasitic load, degraded efficiency, replacement or retrofit of condensers, downtime for installation, and permitting. Each of these factors are discussed below.

Increase in Parasitic Load

The installation of mechanical draft cooling towers will require additional equipment that requires power including new recirculating water pumps, water treatment system, and other miscellaneous instrumentation. The power necessary to run this equipment decreases the plant's net energy production, and is known as the "parasitic load". Although specific parasitic load calculations for cooling tower retrofit at Unit 1 are unavailable, a cooling tower study (WGI 2007) for four units totaling 1,410 MW at another Entergy baseload facility estimated the total parasitic load from the installation of wet cooling towers at 17.772 MW. Assuming a direction ratio of unit output to parasitic load, the parasitic load for the 836 MW Unit 1 retrofit with cooling tower and associated equipment is estimated at 10.537 MW. Therefore, the retrofit of Unit 1 to wet cooling towers would decrease the total plant output to approximately 825 MW.

Degraded Efficiency

The installation of cooling tower(s) at ANO Unit 1 will decrease the efficiency of the generating units due to multiple factors. The cooling tower feasibility study at another Entergy baseload facility estimated an increase of approximately 2 inches of mercury in steam turbine backpressure, higher condenser tube velocities (40%), higher erosion potential (up to double depending on water chemistry and particulate content), and higher circulating water and condenser water box operating pressures (25%) (WGI 2007). Together, these are known as an increase in the net heat rate, which will result in a direct increase in fuel costs to generate an equal amount of power.

Replacement and Retrofit of Condensers

A potential mitigation for some of the increased heat rate is the replacement of the condensers with new condensers designed for use with cooling towers, which may allow the steam turbines to operate at the design backpressure. It is unclear if replacement is possible from a nuclear safety perspective. This would likely require a material alteration of the facility which requires a variety of authorizations from the NRC, including a safety analysis report and license amendments. The new condensers would also likely require additional heat transfer surface, and they may not physically fit in the available space. It is estimated that downtime to install new condensers would be at least 12 months due to the environmental and safety analyses and license amendments and other NRC regulations applying specifically to nuclear facilities.

Retrofitting the condensers would be needed if condensers are not replaced. This would be required to account for the increased water pressure and velocity resulting from the addition of cooling tower(s) that would otherwise result in damage to the circulating water tubes and condenser shell joints, resulting in leakage of circulating water. Retrofitting would also require making structural modifications to the external water boxes and the tube sheets to allow use at the higher pressures and flows. These modifications would require additional external stiffeners, bracing, and structural support. Other potential problems with retrofitting the condensers could include reduced heat transfer capability due to higher circulating water temperatures during high ambient

temperature conditions, and incompatibility of existing materials with cooling tower water chemistry caused by the higher concentrations of dissolved solids compared to once through cooling. Also, the residual hardness and chemicals added to prevent scaling, fouling, and foaming may have an adverse effect on condenser material life.

Downtime for Cooling Tower Installation

The total downtime at ANO to allow for cooling tower installation at Unit 1 is estimated to be 12 months. If the condensers were replaced or retrofitted, this timeline would increase to 24 months of downtime. In addition to downtime, it is estimated that the NRC review process would take an additional 12 months prior to construction being allowed.

Permitting

The installation of new cooling tower(s) at Unit 1 would likely require a major modification to the NPDES permit. Depending upon the location of the new cooling tower(s), coordination and permitting with the USACE may be also required for potential impacts to wetlands or waters of the U.S. In the event that wetlands may be impacted, construction could not be initiated without authorization from the USACE, and mitigation for impacted wetlands may be required. The conversion of ANO Unit 1 to closed cycle cooling would likely represent a material alteration to the facility which requires a variety of authorizations from the NRC, including an environmental assessment and finding of no significant impact, safety analysis, and license amendment. It is expected that the NRC construction authorization and license amendment process may take several years.

Private Cost of Cooling Tower(s) for Unit 1

Private costs included direct costs for equipment, materials, labor, operations and maintenance, as well as additional costs for downtime/outages and permitting. In order to obtain the net present value, all costs were converted to 2018 values using the Consumer Price Index Inflation Calculator provided by the Bureau of Labor Statistics. It was assumed that modifications to the intake canal and discharge systems are not necessary due to the associated reduction in water use and discharge volumes from installation of cooling towers for Unit 1. The total private costs for new cooling towers is shown in Table 33.

Table 33		
Private Costs for Cooling Towers (20 year Operating Period)		
Item Description	**Cost in 2010 Dollars**	**Cost in 2018 Dollars**
Site/Earth Work	$49,035,816	
Equipment	$326,905,438	
Subtotal	$375,941,253	
Indirect Costs	$28,947,476	
Engineering (10%)	$37,594,125	
Construction Management (2%)	$7,518,825	
Insurance (1%)	$3,759,413	
Contingency (10%)	$37,594,125	
Total Capital Cost	**$491,355,218**	**$567,219,954**
Downtime for Installation (Lost Revenue)		$263,640,960
Parasitic Load (Annual Cost X 20 years)		$66,458,966
O&M (Annual Cost X 20 years)		$73,635,760
NRC Reviews		$695,000
Permitting		$300,000
Total Operating Costs		**$404,730,686**
Total Private Costs		**$971,950,640**

External Costs for Cooling Tower(s) for Unit 1

The external costs to install cooling towers for Unit 1 include a variety of environmental impacts, including increased noise from cooling tower fans and circulating water pumps, viewshed impacts, aquatic biology impacts, and wetland impacts. In order to obtain the net present value, all costs were converted to 2018 values using the Consumer Price Index Inflation Calculator provided by the Bureau of Labor Statistics. The total external costs for new cooling towers is shown in Table 34 below:

Table 34		
External Costs for Cooling Towers		
Item Description	**Cost in 2011 Dollars**	**Cost in 2018 Dollars**
Noise	$800	$923
Viewshed	$1,000	$1,154
Reduction in Impingement/Entrainment	($40,200)	($46,406)
Wetlands Mitigation	$100,000	$115,439
Greenhouse Gas	$334,800	$386,492
Total External Costs	**$396,400**	**$457,603**

Fine-Mesh Traveling Screens

This candidate technology can reduce entrainment by physically excluding organisms that would otherwise pass through course mesh screens. Studies have shown that retrofitting a once through cooling system with fine mesh screens can reduce entrainment by approximately 84 percent. Fine mesh screens typically have openings in the screen mesh of less than 2 mm. Small organisms and early life stages that would have otherwise passed through course mesh screens are impinged on the screen surface and removed by water-filled lifting buckets that are carried upward with each rotation of the screen. The screens operate continuously to reduce impingement duration. When each collection bucket passes over the collection trough, fish are gently rinsed into the trough by a low pressure spray wash system. Once in the collection trough, the fish are transported back to a safe release location in the source waterbody.

Unit 1 currently employs eight course-mesh traveling screens with a low pressure spray wash that operates when there is a buildup of debris on the screens. The screens are designed to remove smaller debris and aquatic organisms, and are made of stainless steel panels with 3/8 inch openings. The debris and fish are washed from the screens and transported via a trough to large steel collection baskets that are periodically emptied as waste and not returned to the waterbody, and therefore exhibit 100 percent mortality.

Deployment of fine-mesh screen technology at Unit 1 would require the installation of eight new fine-mesh traveling screens or retrofit of the existing screens with fine mesh panels, and would likely require modifications to the spray wash and the debris management system due to the increased impingement. An effective fish return system would have to be designed and constructed to properly handle the increased impingement rate. The addition of a fish return system to minimize impingement mortality may be feasible from an engineering standpoint, but would incur significant additional costs and potential nuclear safety factors may interfere with the construction and implementation. For example, the increased potential for the fine mesh screens to be completely clogged with debris could cause a significant decrease or complete loss of the available cooling water. During construction of a fish return system, some or all of the existing intake screens or pumps may have to be taken out of service, resulting in decreased cooling water. In the event that the available cooling water was insufficient to adequately cool the reactor, the facility would have to be taken offline.

Dependent upon the debris loading, the screens and spray wash may need to operate continuously. Furthermore, additional pumps, sprays, or pump upgrades may be required to convey the wash water. In addition to capital costs, the addition of a fish return system would result in increased parasitic load from the pumps and spray wash. Finally, the fish return system would have to be routed across several nuclear safety access zones that are separated by various fences. To avoid impacting the safety fences, the fish return would likely have to be routed underground in some areas, resulting in increased costs and pumping difficulty.

Fine-mesh screens also result in increased through-screen velocities and head loss compared to course-mesh screens. Decreasing screen mesh size reduces the effective open area of the screens. High debris loading and screen clogging further reduces the open area and can have substantial effects on through-screen velocities and head loss. Head loss is caused by the

constriction of the water flowing through the screens. Large head losses can lower the water elevation at the circulating water pump suction piping to the point at which pump vortexing and cavitation can occur. Head losses also create greater hydrostatic forces against the screen material which could result in screen failure when the forces exceed the design limits.

The NRC safety analysis for the installation of fine-mesh screens may identify the potential for screen clogging, head loss, and pump failure as a critical issue, even with the operational measures and fish return modifications. Due to the potential for nuclear safety concerns, the installation of fine-mesh screens is not a preferred alternative.

Private Costs for Fine-Mesh Traveling Screens for Unit 1

Private costs are the sum of capital costs and operating costs, and included direct costs for equipment, materials, labor, operations and maintenance, as well as additional costs for downtime/outages and permitting. In order to obtain the net present value, all costs were converted to 2018 values using the Consumer Price Index Inflation Calculator provided by the Bureau of Labor Statistics. The total private costs for new fine-mesh screens is shown in Table 35 below:

Table 35
Private Costs for Fine Mesh Traveling Screens

Item Description	Cost in 2018 Dollars
Equipment (8 screens)	$4,880,456
Installation (8 screens)	$124,136
Fish/Debris Trough System Modifications	$3,836,000
Subtotal	$8,840,592
Indirect Costs (10%)	$884,059
Construction Management (2%)	$176,812
Insurance (1%)	$88,406
Contingency (10%)	$884,059
Total Capital Cost	**$10,873,928**
Reduced Capacity During Installation (Lost Revenue)	$10,112,256
O&M (annual costs X 20 years)	$8,000,000
NRC Reviews	$344,438
Permitting	$100,000
Total Operating Costs	**$18,556,694**
Total Private Costs	**$29,430,622**

External Costs for Fine-Mesh Traveling Screens for Unit 1

The external costs to install fine-mesh traveling screens for Unit 1 include a variety of environmental impacts, including increased noise from constantly rotating screens and spray wash pumps, viewshed impacts, aquatic biology impacts, and wetland impacts. In order to obtain the net present value, all costs were converted to 2018 values using the Consumer Price Index Inflation Calculator provided by the Bureau of Labor Statistics. The total external costs for new fine-mesh traveling screens is shown in Table 36 below:

Table 36
External Costs for Fine Mesh Traveling Screens

Item Description	Cost in 2011 Dollars	Cost in 2018 Dollars
Noise	$800	$923
Viewshed	$1,000	$1,154
Reduction in Impingement/Entrainment	($40,200)	($46,406)
Wetlands Mitigation	$100,000	$115,439
Greenhouse Gas	$83,700	$96,623
Total External Cost	**$145,300**	**$167,734**

40 C.F.R. § 122.21 (r)(11) - Benefits Valuation Study for Candidate Entrainment Reduction Technologies

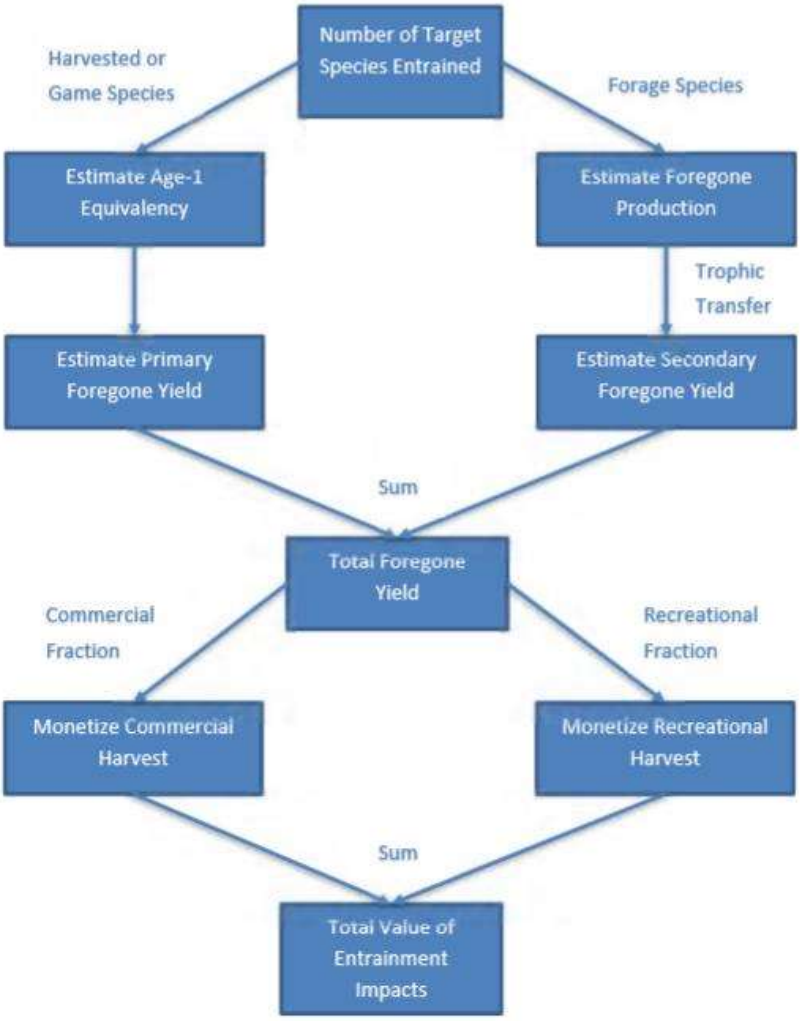
This study is required for units with actual intake flow greater than 125 MGD. This study was required for Unit 1 because this unit has an actual intake flow of 914.9 MGD. This study was not required for Unit 2 because this unit has an actual intake flow of 19.4 MGD. Therefore, the following discussion relates only to Unit 1.

Three categories of benefits from entrainment reduction technologies were considered in this study. These categories were fishing, nonuse, and endangered species. The social benefits are the sum of these three categories. Fishing is the primary source of impacts. The fishing impacts were assessed and valued using the process described in Part A of the EPA 2006 Regional Benefits Analysis for the Final Section 316(b) Phase III Existing Facilities Rule (EPA 2006). The nonuse impacts to the fishery and the potential for impacts to endangered species in the Lake Dardanelle area are qualitatively discussed.

Fishing Benefits Valuation

Figure 5 shown below provides an overview of the steps followed to estimate and value the impacts to commercial and recreation fishing.

Figure 5



EPA Process for Estimating the Value of Entrainment Impacts

The analysis focused on the target species that represented all of the species being entrained and are of commercial or recreational value because the 316(b) rule is specific to commercial and recreational species and endangered species. The annual entrainment for these target species were divided into two groups: game/harvested species and forage species. The next step was to estimate the decrease in the number of fish caught commercially and recreationally, termed foregone yield. The forgone yield of game species was estimated directly as primary foregone yield. Forage species, however, provide food for the predator game species, and thus, impacts to forage species were

estimated as foregone secondary yield. The foregone yield attributable to each type of species was summed and divided into commercial and recreational harvest for valuation. Commercially and recreationally caught fish were valued separately, then summed for the total monetized impacts from entrainment.

Based on Figure 1, two different methods are used to estimate foregone yield, depending on whether the species is a game/harvested species or a forage species. For fishery species that are considered game species and are typically harvested recreationally or commercially, the primary foregone fishery yield was calculated using Equation 7 from the 2006 EPA Benefits Analysis (EPA 2006). In the ANO analysis, this process applied to white bass and freshwater drum. The gizzard and threadfin shad are forage fish, so the foregone production was calculated due to those fish being unavailable for consumption by larger species (EPA 2006, Equations 8 through 10). The estimated primary yield and secondary yield were summed to get the total foregone yield from entrainment at ANO, as shown in Table 37 below:

Table 37
Estimated Foregone Yield of Target Species (in pounds)

Species	Primary Yield	Secondary Yield (from Gizzard and Threadfin Shad)	Total Yield
White Bass	7,726	3,740	11,466
Freshwater Drum	2,753	11,790	14,543
Total	10,479	15,530	26,009

The breakdown between recreational and commercial yield is shown for both species in Table 38 below:

Table 38
Estimated Foregone Recreational and Commercial Yield of Target Species (in pounds)

Species	Recreational Yield	Commercial Yield	Total Yield
White Bass	11,466	N/A	11,466
Freshwater Drum	9,162	5,381	14,543
Total	20,628	5,381	26,009

The next step is monetizing the commercial and recreational fishing impacts caused by entrainment at ANO. For freshwater drum, an average recreational catch weight of 5 pounds was calculated from the recreational harvest estimates and weights reported in the EPRI Ohio River study (EPRI 2009). For white bass, information on the average weight from fish caught at Lake Maumelle in Pulaski County, Arkansas, and several reservoirs in eastern Tennessee was used. The average of the weights for white bass was 1.25 pounds per fish. The 2018 values per pound are shown in Table 39 below:

Table 39			
Estimated Recreational Fishing Value (in 2018 dollars)			
Species	**Value per Fish**	**Pounds per Fish**	**Value per Pound**
White Bass	$10.55	1.25	$8.41
Freshwater Drum	$2.61	5	$0.52

To estimate the annual value of recreational and commercial fishing impacts, the foregone yield estimates in Table 38 were multiplied by the value per pound estimates in Table 39. The resulting values accounted for 99 percent of the species entrained at ANO in the 1977 through 1987 entrainment study. The non-target species were accounted for by multiplying the target species benefits by 1% and summing both target and non-target impacts to get the total annual impacts. The annual impacts were then discounted at 3 and 7 percent over a 51 year period to estimate the present value of the impacts. See Table 40 below for the results of the estimated present value and annualized value of foregone yield due to entrainment at ANO Unit 1.

Table 40				
Estimated Present Value and Annualized Value of Foregone Yield Due to Entrainment (Social Benefits from Fishing)				
Technology	**Present Value**		**Annualized Value**	
	3%	**7%**	**3%**	**7%**
Existing technology	$2,689,129	$1,433,354	$100,604	$96,843

Nonuse Benefits Valuation

The 2014 316(b) rule requires an assessment of nonuse benefits. Nonuse benefits are notoriously difficult to monetize, and although EPA conducted a survey to measure total values (use values plus nonuse values) for aquatic improvements under the 316(b) rule, those results were not designed for site-level application. As a result, nonuse benefits were evaluated qualitatively rather than quantitatively.

One of the challenges for monetizing nonuse values is the that people generally do not hold a value (and consequently, a willingness to pay) for something they are unaware exists. A study by Johnson et al. (2001) argues that "if there is no perceived injury, then there is no compensable welfare loss, even if the injury causes an actual reduction in the quality of the resource."

This assessment indicates that the likelihood of significant nonuse benefits from entrainment impacts at ANO is extremely low. The estimated 1.5 million A1E fish entrained annually at ANO (A1E is the number of fish that would have survived to age one if they had not been entrained during the larvae stage) is less than one percent of the population of the lake and 96 percent of the A1E entrained are forage fish that are food for game species. Any change in technology would result in a marginal change in the resource that may not be perceptible to users, much less nonusers. Additionally, the use benefits associated with entrainment are relatively small, and likewise, the nonuse benefits are expected to be small. Finally, the majority of the general population is unaware that there are

entrainment impacts, thus they are unlikely to hold significant nonuse values for a change in those impacts. This evaluation concluded that the nonuse benefits associated with conversion from the current once-through CWIS are negligible.

Endangered Species Benefits Valuation

In addition to evaluating impacts to the target species, the 316(b) rule requires an evaluation on any potential impacts to endangered species. The EPA identifies two endangered species whose habitat range indicates they may be present in the Lake Dardanelle area: the Least Tern and the Arkansas River shiner.

The Least Tern is the smallest member of the gull and tern family, and feeds on small fish, crustaceans, and insects that are caught near the water's surface. According to the Audubon Society, the Least Tern are known to use the sand bars of Lake Dardanelle in the area of Lake Dardanelle State Park during migration. No known nest sites exist at this time, although they have in the past and the habitat exists for nesting. The only way the Least Tern could be affected by entrainment at the ANO facility is if the entrainment occurred at levels high enough to affect the availability of their food source. The Clupeidae species that account for over 96 percent of entrainment at ANO could potentially be a food source, however, the Least Tern also feeds on other small fish, as well as crustaceans and insects. Together, these factors suggest that the entrainment at the ANO facility is unlikely to affect the overall population of Clupeidae species, and that impacts on the Least Tern population are extremely unlikely.

The Arkansas River shiner is a small, streamlined minnow that is generally less than 2.5 inches in length. It feeds on small aquatic insects and invertebrates, and is listed as a federally threatened species. However, this is not a species that is found in Lake Dardanelle. According to the Oklahoma Department of Wildlife Conservation (ODWC), "nearly all of the remaining Arkansas River shiners occur in the Canadian River in Oklahoma, western Texas and eastern New Mexico. A small population may persist in the Pecos River in southwestern Texas where they were accidentally introduced." (ODWC 2018). The Arkansas River shiner is believed to be extirpated from Arkansas, and the last time it was recorded in Arkansas was in 1939 (AGFC 2017). Thus, there is no evidence to suggest that this species could be impacted by the CWIS technology at the ANO facility.

The US Fish and Wildlife Service (USFWS) lists a total of 32 threatened and endangered animals in Arkansas, including 5 fish and 16 shellfish (2018a). The fish include the Ozark cavefish, leopard darter, yellowcheek darter, Arkansas River shiner, and pallid sturgeon. None of these fish species are listed by EPA as occurring in the Lake Dardanelle area. The Ozark cavefish is a small (2.5 inches or less), eyeless, pinkish-white fish that lives only in the dark caves, sinkholes, and underground springs of the Ozark Highlands region (USFWS 2018b). The leopard darter, a medium-sized spotted darter, occurs only in the Cossatot and Robinson Fork rivers, in the Ouachita Mountain and South Central Plains regions (AGFC 2017). The yellowcheek darter, a small (2.5 inches or less) brown darter, occurs only in the tributaries of the upper Little Red River system (AFGC 2017). The pallid sturgeon, a large species known to grow up to 8 feet long, has only been found in Arkansas in a few records, and have not been found at all in Arkansas' large rivers in more recent years (AGFC 2017).

The shellfish species include two types of cave crayfish, turgid (pearlymussel) blossom, Arkansas

fatmucket, neosho mucket, pink (pearlymussel) mucket, scaleshell mussel, snuffbox mussel, Louisiana pearlshell, Curtis pearlymussel, fat pocketbook, Ouachita Rock Pocketbook, Speckled Pocketbook, Rabbitsfoot mussel, Spectaclecase mussel, and Winged Mapleleaf mussel. The EPA critical habitat and range overlap analysis includes most of these species, with the exception of the Cave Crayfish and Speckled Pocketbook, and none of the included species occur in the Lake Dardanelle area. Neither of the Cave Crayfish species are believed in inhabit Lake Dardanelle; *Cambarus aculabrum* exists in only Benton and Washington counties in Arkansas and McDonald county in Missouri (USFWS 2018c) and *Cambarus zophonastes* exists only in Hell Creek Cave, Nesbitt Spring Cave, and Town Branch (USFWS undated). Finally, the Speckled Pocketbook is known to only occur in forks of the Little Red River and in Big Creek (USFWS 2018d). Thus, none of the mussels are expected to exist in Lake Dardanelle.

To summarize, the only threatened and endangered species known to inhabit Lake Dardanelle that could potentially be affected by the CWIS at the ANO facility is the Least Tern. As described above, the impacts are extremely unlikely because the entrainment impacts are very small compared to the potential food source provided by the 34,000 acre lake.

This study also requires a discussion of mitigation efforts completed prior to October 14, 2014 including how long they have been in effect and how effective they have been. The only mitigation efforts completed at the ANO facility prior to October 14, 2014 is the deployment of the shad barrier net starting in 2000.

This study also requires a discussion, with quantification and monetization, where possible, of any other benefits expected to accrue to the environment and local communities, including but not limited to improvements for mammals, birds, or other organisms and aquatic habitats. As discussed above, Clupeidae species, specifically gizzard and threadfin shad, account for the majority of entrainment at the ANO facility. Reducing entrainment may increase the population of these shad, providing additional food for predator fish. Mammals and birds that feed on Clupeidae species may also benefit from an increase in population of these fish. However, these benefits are expected to be very small. First, the total change in population of fish is relatively small, less than one percent of the population of the lake. Second, the overall impacts to the food chain are complicated and difficult to predict. The AGFC has concluded that entrainment impacts have not impacted the maintenance of a quality recreational fishery in Lake Dardanelle (AGFC 1995). Introducing additional forage fish could potentially change the balance of other fish populations in the lake. However, such impacts would depend on other food sources available and other factors that limit or affect fish populations in the lake. Lake Dardanelle is a managed fishery, further complicating any attempts to predict the outcome of changes in entrainment through the food web.

This study also requires a discussion of any benefits expected to result from any reductions in thermal discharges from entrainment technologies. The Final Environmental Statement for ANO Unit 1 documents that at the time of initial permitting, the ecological effects from thermal discharges of ANO Unit 1 on the entire lake were expected to be negligible (USACE 1973). This reference stated, “In general, no detrimental effect on the fish population of the main body of the lake is expected; fish will tend to avoid and swim under the heated areas. Thermal barriers to fish movement are not expected to occur in the lake.” During the summer months a reduction in water temperatures from Unit 1 could increase the amount of water recreational activities near the ANO facility.

Conversely, this reduction in heated water during the winter months could reduce the amount of warm water refuge areas provided by the heated discharge. While no detrimental effect (i.e. freezing of the lake or changes in water quality) would occur from reduction of the warm water discharge, the area around the discharge embayment does provide good fishing during the winter months and may reduce the fishing success by recreational fishermen.

40 C.F.R. § 122.21 (r)(12) - Non-water Quality and Environmental Impacts Study for Candidate Entrainment Reduction Technologies

This study is required for units with actual intake flow greater than 125 MGD. This study was required for Unit 1 because this unit has an actual intake flow of 914.9 MGD. This study was not required for Unit 2 because this unit has an actual intake flow of 19.4 MGD. Therefore, the following discussion relates only to Unit 1.

This study requires a discussion of the following non-water quality and environmental impacts for the candidate entrainment technologies identified as technically feasible for Unit 1 (wet cooling tower and/or fine-mesh traveling screens):

- Energy consumption impacts
- Air emission impacts
- Human health impacts associated with air emission impacts
- Environmental impacts associated with air emission impacts
- Noise impacts
- Safety impacts
- Reliability impacts
- Water consumption impacts

Energy Consumption Impacts

A retrofit from once-through cooling to closed-cycle recirculating cooling system would require installation of a cooling tower. This would require a change in condenser design to permit the condenser-tower system to be installed as an optimized unit. Station auxiliary loads would be expected to increase by 10,537 kW, resulting in a decrease in total plant output by approximately 11 MW. Energy losses associated with operation of fine-mesh traveling screens were estimated to be between 0.15 to 0.20 MW per unit. These loads would have a negligible effect on generating capacity.

Air Emission Impacts

The retrofit of a natural draft or mechanical draft cooling system is not expected to change the emissions from the currently permitted start-up boiler and the heating boilers. The two common air emissions associated with cooling towers are draft and visible plume. Drift is the small amount of circulating water entrained in the air stream and carried out of the tower as droplets. Because the droplets contain the same chemical impurities as the water circulating through the tower, the particulate matter constituent of the drift droplets may be classified as an emission (Reisman and

Frisbie 2002). Anticipated particulate emissions associated with the operation of a natural draft cooling tower at Unit 1 were estimated to be the same as the currently permitted emissions for Unit 2 cooling tower (0.7 lb/hr and 3.2 tons/yr of PM_{10}). Estimated particulate emissions associated with the operation of four mechanical draft cooling towers at Unit 1 are 6.2 lb/hr and 27.2 tons/yr of PM_{10}.

Human Health Impacts

Estimates of human health impact from the air emissions of particulate matter associated with installation of cooling towers are summarized in Table 41 below based on facilities that are similar in type and regional locations.

Table 41

Estimated annual risk of increased mortality and morbidity due to cooling tower emissions.

(WTP estimates were based upon USEPA-calculated human health risk estimates, which represent the high end of risk; however EPRI research indicates the low end risk estimate could approach zero.)

	Mortality Results (age 30+)				Morbidity Results (age 65+)				
	Exposed Population	Baseline Annual Death Rate per 100,000 people[a]	Baseline Annual Number of Deaths	Estimated Annual Increase in Number of Deaths[b]	Exposed Population	Disease	Baseline Annual Hospital Admissions Rate per 10,000 People[c]	Baseline Annual Number of Cases (Hospital Admissions)	Estimated Annual Increase in Number of Cases[d]
BTPA - Southeast	183	1,520	3	0.0003	41	CVD	4,267	17	0.003
						COPD	456	2	0.0002
						Pneumonia	982	4	0.0005
BTPD - Southeast	535	1,249	7	0.002	99	CVD	3,369	33	0.009
						COPD	372	4	0.0006
						Pneumonia	1,018	10	0.002
RFH - Southeast	23,407	1,339	313	0.07	5,397	CVD	3,369	1,818	1
						COPD	372	201	0.1
						Pneumonia	1,018	550	0.3
RFJ - South	5,784	1,605	93	0.003	1,206	CVD	3,369	406	0.02
						COPD	372	15	0.001
						Pneumonia	1,018	123	0.004

[a] Annual death rate per 100,000 (100k) (based on county data) for ages 25+; data were not listed for ages 30+.

[b] Estimates presented here for increases in mortality and morbidity endpoints are based on USEPA methodology and represent the high end of upper bound risk. The low end of the upper bound risk may approach zero.

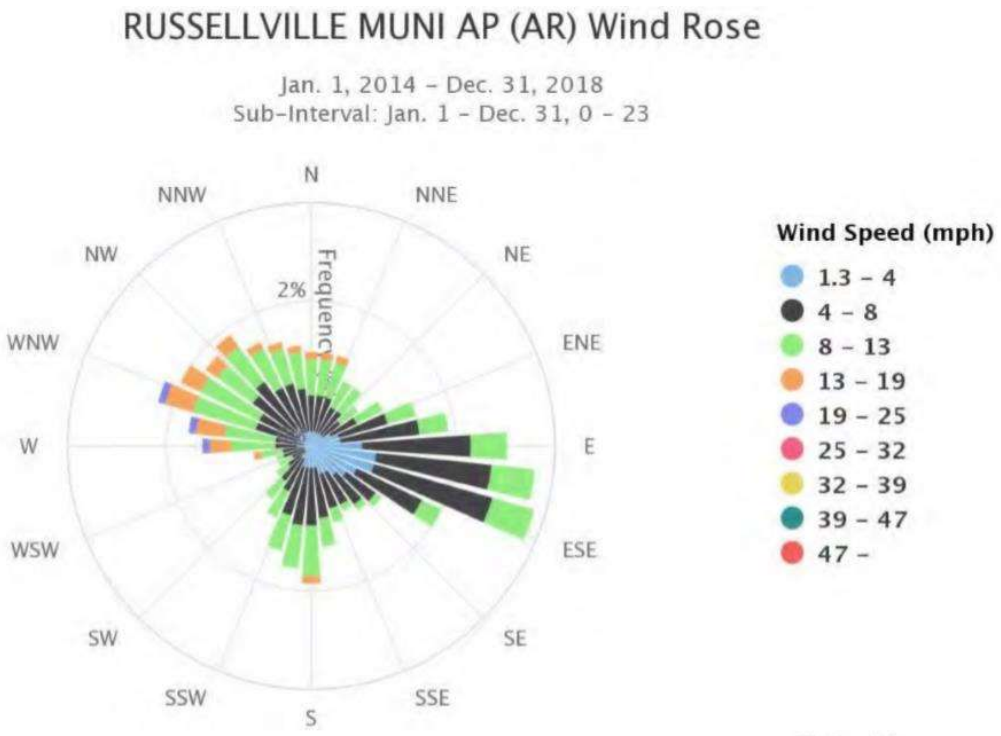
[c] Hospital Admissions (Number of Cases) estimates are based on admission of patients aged 65+ years with cardiovascular disease (CVD), chronic obstructive pulmonary disease (COPD), or pneumonia. Site-specific hospital admissions baseline rates are not available; instead, baseline rates were based on reference cities selected to be representative of facility locations.

[d] No census data were available for nearby military base.

Environmental Impacts

The environmental impacts of the additional air emissions associated with installation of either a natural draft cooling tower or mechanical draft cooling towers were evaluated. Wind roses were created to characterize the wind speed and direction for five years of data from 2014 through 2018, as shown in Figure 6 below:

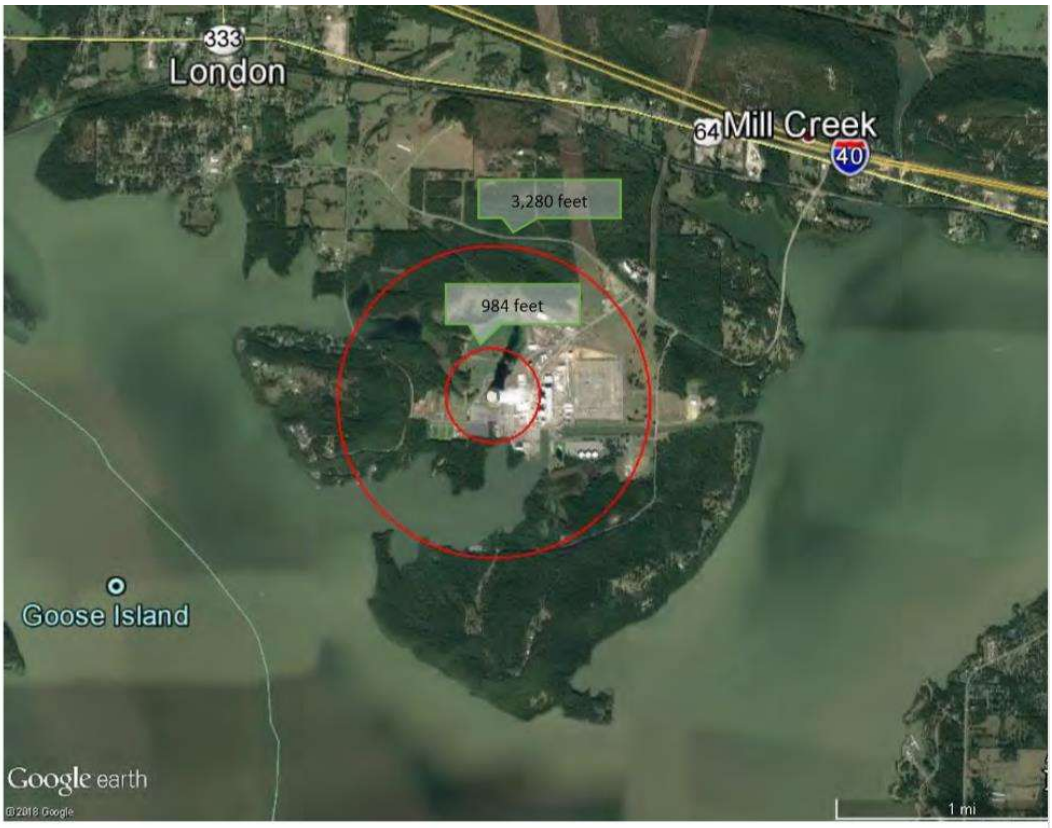
Figure 6



Wind Rose at Russellville Municipal Airport, Arkansas

Based on this data, PM emissions would move predominantly northwest and west of the towers. The second most prominent wind direction would move PM emissions to the east and east-southeast. Studies of distribution of liquid droplets from natural draft cooling towers show that the droplets are transported a maximum of 3,280 feet from the cooling tower, with the maximum number of droplets occurring at a distance of 984 feet from the cooling tower (McKelvey and Brooke 1959). Figure 6 below shows these distances. Note that 984 feet radius is on ANO property and the majority of the 3,280 feet radius is uninhabited areas. The nearest residential receptor is located 2,640 feet to the southwest. Since the wind direction carries PM emission in this direction less than 0.5 percent of the time, it is not anticipated to be significantly impacted by PM emissions.

Figure 6



Distances from Cooling Tower Locations

Mechanical draft cooling towers would have less emission impact than natural draft tower because there would be less travel time and dispersion as the release would be closer to the ground.

No direct emissions for modification of existing intake screens to fine mesh intake screens would be expected. Parasitic losses would be low and associated increases in fuel use and air emissions would be insignificant. All mechanical components would be run by electric motors. No additional land would be required for modifying the existing intake to accommodate the fine mesh screens.

Noise Impacts

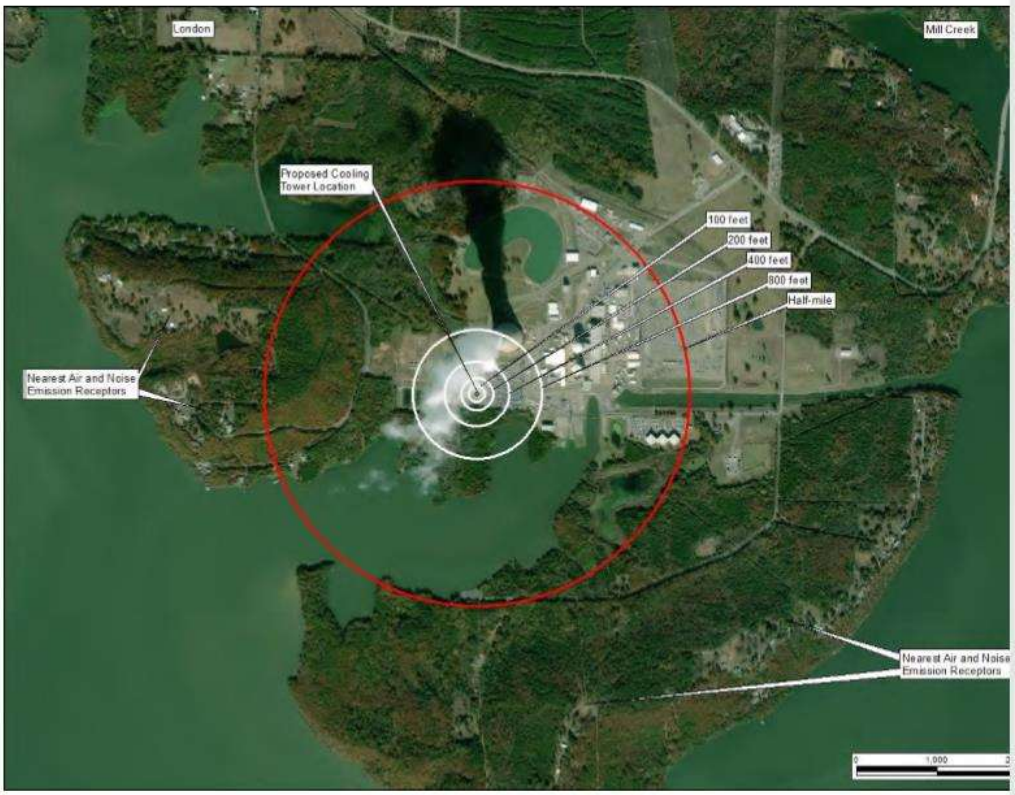
The EPA has established certain noise limits to protect human health and welfare. The basic standard for outdoor activity interference and annoyance for noise limits is 55 dBA (A-weighted decibels). The US Department of Housing and Urban Development (HUD) outlines noise criteria and standards in 24 C.F.R. Part 51. HUD considers exterior noise at sensitive receptors to be “acceptable” if it does not exceed a day and night average sound level of 65 decibels, “normally acceptable” if it is between 65 dB and 75 dB, and “unacceptable” above 75 dB.

Natural draft cooling towers generate and radiate noise which is dependent on landscape, existing structures, and prevailing weather conditions, but have a small noise footprint due to not having fans,

motors, or other moving parts. Retrofitting to a second natural draft cooling tower is not anticipated to generate noise conditions above ambient conditions beyond the ANO property.

Sources of noise associated with mechanical draft cooling towers are from pumps, fans, and "fill" noise cause by the flow of water through the tower fill. Typical sound levels are about 70 dBA at a distance of 50 feet from the tower. Retrofitting to three mechanical draft towers is not anticipated to result in an impact offsite. Figure 7 shows the nearest noise receptors to the potential cooling tower location.

Figure 7



Noise Receptors Located Nearest to the Proposed Cooling Tower Locations

The sound pressure level in dB is 20 times the log of the ratio of the measured pressure to the static pressure given by the following equation:

- **L_p (sound pressure level).** The sound pressure in dB is 20 times the log of the ratio of the measured pressure, p, to the static pressure, p_o, where p_o is 20 μ Pa.

$$L_{pa} = 20Log_{10}\left(\frac{p}{p_o}\right)dB \quad (re\ 20\mu Pa)$$

Table 42 below shows the calculated estimated noise levels at varying distances. These levels were calculated using the 70 dBA for a typical mechanical draft tower and using three towers using the mathematical equation for sound pressure level.

Table 42	
Estimated Noise Levels	
Noise Level	**Distance**
70 dBA	50 ft.
64 dBA	100 ft.
60 dBA	200 ft.
54 dBA	400 ft.
50 dBA	800 ft.

Safety Impacts

Wet cooling towers can produce large visible plumes that can create potential safety impacts such as fogging, low visibility, and icing. The occurrence of ground level plume fogging and icing are anticipated to minimal due to distance from the receptors and frequency, although either factor could occur at ANO. Some slight increase in local fog could be expected in the vicinity of the tower itself during cold weather or under very stable atmospheric conditions. However, this effect should not be significant at distances 0.5 miles or more from the tower. There are no residences or major roadways within 0.5 miles from ANO. Fogging is expected to occur at ground levels within the plant itself with the primary months being January and October. Maximum downwind extensions of about 10 miles in January, 2.5 miles in October, and 1 mile in July were estimated by a 1973 AP&L study. These potential impacts are expected to be short term.

Icing could occur when the ambient dry bulb temperature is below 32 ºF during fogging conditions. January is the predominant month that fogging and icing conditions could occur at ANO as a result of the cooling tower plume. Icing is anticipated to be localized due to the short distance the fogging effect is predicted to cover the area around the plant. The distance of the fogging effect is not expected to change if cooling tower(s) are installed for Unit 1. The use of cooling towers for Unit 1 would not require the need for emergency cooling water.

Reliability Impacts

The EPA completed an analysis looking at reliability and the effects of closed-cycle cooling on a national energy reliability level and found that the effects would be minimal (EPA 2014). At ANO, it is anticipated that lost energy due to construction downtime during a cooling tower retrofit and the energy penalty would not have an effect on local grid reliability. ANO can provide reliable energy through current operations of Unit 2. If there is a change-out of condensers, it is anticipated the shut down and conversion over to the cooling towers would take up to 24 months. Entergy is a member of Midcontinent Independent System Operator (MISO) which would allow for additional coverage and replace potential lost energy within the Arkansas region. Cooling water makeup would be provided via a cooling water intake canal from Lake Dardanelle, which has sufficient holding capacity for supporting cooling water needs of a closed cycle cooling system at Unit 1. Icing of the

switchyard and power lines is possible due to low winter temperature occurring in the region. These possible icing occurrences would be short term (3-5 days) and would not create long term reliability issues for the grid system. No significant icing problems associated with Unit 2 cooling tower have occurred since it went into operation, therefore no icing problems are anticipated if additional cooling tower(s) are installed at Unit 1.

Water Consumption Impacts

The current consumptive water losses due to the operation of Unit 1 and Unit 2 averages 14 cfs for Unit 1 and 27 cfs for Unit 2. Comparison of these water consumption values must be scaled due to differences in the generation capacity of each unit. Unit 1 has a capacity of 836 MW, while Unit 2 has a capacity of 987 MW. Assuming a direct ratio, the Unit 2 cooling tower would consume 22.87 cfs if running at a similar capacity to Unit 1. If Unit 1 were converted to a closed cycle system with wet cooling tower(s), the resulting estimated increase in water consumption is approximately 63%. The total consumptive water losses from the lake from the operation of both units is currently about 40 cfs, which is 0.1 percent of the average inflow to the lake. Conversion of Unit 1 to either natural draft cooling tower or mechanical draft cooling towers would result in evaporative water losses of around 25.5 cfs for Unit 1. In summary, the consumptive water loss associated with Unit 1 operating as closed cycle system with wet cooling tower(s) would increase from 14 cfs to approximately 25.5 cfs.

40 C.F.R. § 122.21 (r)(13) – Peer Review of (r)(10-12)

The applicant notified DEQ of selection of the selected peer reviewer on April 16, 2019. The selected peer reviewer was Lial Tischler, Ph.D., P.E. The 40 C.F.R. §§ 122.21(r)(10) and (r)(11) studies and supporting materials were issued for peer review on April 8, 2019. Peer review comments were received by ERM on April 15, 2019. ERM review of the comments and discussion with ANO were completed on April 29, 2019. ERM addressed the peer review comments and required changes were made to (r)(10-12) studies accordingly and submitted to DEQ in final form on May 16, 2019.

18. **SOURCES**

The following sources were used to draft the permit:

A. Application No. AR0001392 received June 26, 2018.
B. APC&EC Rule 2.
C. APC&EC Rule 3.
D. APC&EC Rule 6, which incorporates by reference certain federal Rules included in Title 40 of the Code of Federal Rules at Rule 6.104.
E. 40 C.F.R. Parts 122 and 125.
F. 40 C.F.R. Part 423.
G. Discharge permit file AR0001392.
H. Discharge Monitoring Reports (DMRs).
I. "2018 Integrated Water Quality Monitoring Assessment Report," DEQ.
J. "2018 List of Impaired Waterbodies (303(d) List)," DEQ.
K. NPDES Permit Rating Worksheet (MRAT).

L. Clean Water Act Section 316(b).
M. Letter from DEQ to Entergy responding to waiver request of 40 C.F.R. § 122.21(r) studies for Section 316(b) compliance, June 29, 2016.
N. "316(b) Impingement Sampling 12-Month Summary Report," and "316(b) Supporting Documentation for NPDES Permit Renewal - §122.21(r)(2)-(9)," June 15, 2018, (Begins on page 381 of permit application as Attachment 2).
O. "316(b) Supporting Documentation for NPDES Permit Renewal - §122.21(r)(10)-(13)," May 16, 2019.
P. Attachment 5 – Impingement Sampling 2-Year Summary Report, November 2018.
Q. "BTA Evaluation of the Impingement Technology Performance Optimization Study," November 14, 2018.
R. Attachment 6 – Impingement Optimization Fact Sheet, July 12, 2018.
S. "Identification and Classification of Perennial Streams of Arkansas," Arkansas Geological Commission.
T. Continuing Planning Process (CPP).
U. Technical Support Document for Water Quality-based Toxic Control.
V. Site Visit Report for Outfall 013, July 31, 2015.
W. Evaluation of metal test results at Outfall 013 at sampling location 7, September 16, 2015.
X. Follow up letter from ADEQ to ANO on site visit for Outfall 013, October 9, 2015.
Y. Site Visit Report, July 26, 2018.
Z. Inspection Report, July 26, 2018.
AA. Compliance Review from Enforcement Administrator, January 8, 2020.
BB. Google Earth.
CC. Jet-Mix equation from CPP.
DD. "EPA Quality Criteria for Water 1986" (Gold Book).
EE. Lead retest sample 1 at Outfall 008, January 31, 2019.
FF. Lead retest sample 2 at Outfall 008, February 6, 2019.
GG. Lead retest sample 3 at Outfall 008, February 13, 2019.
HH. Cooling tower maintenance chemical certification, August 15, 2018.
II. TRC retests at Outfalls 006, 008, and 009 submitted March 11, 2020.
JJ. Copper, Lead, and TRC retests at Outfall 010 submitted April 7, 2020.
KK. USFWS response for 60-day early review of application, dated September 19, 2018.
LL. Change of Authorization letter dated October 8, 2019.
MM. Updated Facility Legal Name on Form 1, February 2, 2020.

19. PUBLIC NOTICE

The public notice of the draft permit was published for public comment on October 8, 2023. The last day of the comment period was thirty (30) days after the publication date. No public comments were received on the draft permit.

Copies of the draft permit and public notice were sent via email to the Corps of Engineers, the Regional Director of the U.S. Fish and Wildlife Service, the Department of Parks, Heritage, and Tourism, the EPA, and the Arkansas Department of Health.

20. PERMIT FEE

In accordance with Rule 9.403(A)(1), the annual fee for this permit is $15,000.

21. POINT OF CONTACT

For additional information, contact:

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